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Notes on Papayaceæ. By JOAQUIM CORREA DE MELLO and RICHARD SPRUCE. Communicated by DANIEL HANBURY, F.L.S.

(Plate I.)

[Read February 7, 1867.]

THE principal object of this paper is to put on record certain observations made by Senhor Mello on living plants of the common Papaw, and of the prickly-stemmed species known in South Brazil as *Jaracatiá*, comprising some important additions to our knowledge of a tribe which, from the unwieldy size of the foliage and the succulent, perishable nature of the fruits, cannot be adequately represented in our herbaria *.

Living specimens of one or two species in our conservatories have rendered us familiar with the aspect of the Papayaceæ. They may be shortly described as *erect-growing Gourds*, the twining stem of the latter being what chiefly distinguishes them; and there is considerable affinity to Passion-flowers, not only in structure, but in the occasional presence in Passion-flowers of a milky juice, which is never wanting to the Papaws.

The essential characters of Papayaceæ are chiefly the following (those included in brackets having been added or amended from the observations of Senhor Mello) :—

Trees, usually of humble growth and of brief existence, with a turbid milky juice like that of Fumitories. *Trunk* erect, from 4 to 40 feet high, in some species scarcely thicker than the finger, in others as thick as a man's body, ringed with the leaf-scars; *bark* very thin, greenish, sometimes aculeate; *wood* a mere

* Senhor Mello's observations were communicated in a letter to Mr. Hanbury, and were accompanied by illustrative specimens and drawings.

fibrous shell, not exceeding 2 or 3 inches in thickness even in the stoutest species, filled with a dense firm pith. *Branches* usually 0, from the secondary axes being annual, *i. e.* floriferous peduncles, or else reduced to floriferous axillary nodes; but sometimes the peduncles are replaced by long wand-like branches.

Leaves crowded towards apex of stem, alternate, large, palmately (rarely pinnately) nerved, usually deeply and sometimes compoundly lobed, rarely subentire, but in *Jaracatiá* distinctly digitate; *petioles* elongate, sometimes reaching 3 to 4 feet; *stipules* 0.

Flowers in axillary racemes or panicles [whereon the secondary peduncles are cymuliferous, the axial flower being more precocious than the rest, and often diverse in structure], usually unisexual and dioicous [but sometimes polygamous, with the flowers all ♀ on some plants, all ♂ on others, and on others bisexual and ♂].

Calyx free, very minute, 5-lobed. *Corolla* of 5 (rarely of only 4) ligulate petals, more or less united into a monopetalous corolla, rarely (in some ♀ flowers) free to the very base, either imbricated and subcontorted in æstivation, or inflexo-valvate. ♂ *stamens* 10, in two rows, fixed on the throat of the corolla by very short filaments; *anthers* erect, splitting lengthwise, often partly imperfect. ♀ *ovary* free, 1-celled, with 5 parietal placentæ [which sometimes project so far inwards as to meet below, and render the ovary half 5-celled]; *ovules* 00, anatropous; *styles* almost 0; *stigmata* 5, continuous with the carpels, alternating with the petals. [Bisexual: see the description given below.]

Fruit succulent, 1-celled, or spuriously 5-celled [by the further intromission of the placentæ after fertilization, until they meet in the axis of the fruit]. *Seeds* 00, ovoid, subcompressed, usually rugose or echinate, and with a viscous envelope which is of the nature of an aril. *Embryo* in the axis of fleshy albumen, with flat cotyledons and a taper radicle next the hilum.

I proceed to quote from Senhor Mello's notes his description of three forms under which the common Papaw (*Carica papaya*, L.=*Papaya vulgaris*, DC.) occurs at Campinas, in the Province of São Paulo, Brazil (latitude about 24° S.)—premising that the Brazilians call the plant *Mamoeiro*, and the fruit *Mamão* (plural *Mamões*).

Form I. ♀=*Mamoeiro femea* Brasiliensium.—*Inflorescence* axillary; *peduncles* solitary, 1–2 in. long, bearing 2 to 4 shortly

pedicellate flowers, ***whereof the terminal one is developed much earlier than the rest, and constantly produces a fruit***, whereas the others fall away unfertilized. *Corolla* of 5 *distinct* petals, lineari-lanceolate (10–12 × 1½–2 lines), erect at the base, then reflexed and spirally twisted towards the right. *Stamens* or staminodia altogether absent. *Ovary* 4½–6 × 3–4½ lines, ellipsoid or subobovoid subacuminate, 1-celled, with 5 parietal nearly flat placentæ occupying almost the whole interior surface, 00-ovulate; *style* continuous with the ovary, very short; *stigmata* 5, linear, fleshy, flattened, radiating, dilated and subpalmately laciniated at the apex (much after the same fashion as the leaves), stigmatose on the whole upper surface. *Fruit* pendulous on a *short* peduncle of 1 to 2 inches, 1-celled, 00-seeded.

FORM II. bisexual and ♂ = *Mamoeiro macho* vel *de cordél* Brasiliensium.—*Peduncles* axillary, trifid at the base, the lateral branches 2–8 inches long, 1- or few-flowered; the medial branch 12–24 inches long, bearing above the middle two or three partial peduncles, which are subdivided into several 4- or 5-flowered pedicels.—Bisexual or *fertile flowers* from one to four on each panicle, viz. one (or 0) at the apex of each partial peduncle. *Corolla* gamopetalous, tubuloso-campanulate (10–12 × 2½–3 lines), 5-lobed, lobes erecto-patent or subreflexed. *Stamens* 10, inserted in the throat of the corolla in two series. *Ovary* obovoideo-oblong, almost club-shaped, obtuse, 9–10 lin. long, 2–2½ lin. broad at the base, 4–4½ lin. in the upper part; ***placentæ more salient (intromissæ) than in the ♀ plant***; *stigmata* cut in the same way, but smaller. ***Fruits pendulous on long peduncles*** (of 8–30 in.), nearly always ***asymmetrical or gibbous***, from the absence or malformation of one or more of the stigmata and the consequent abortion of the placentæ pertaining thereto.—♂ or *sterile flowers*: *Corolla* gamopetalous hypocrateriform 5-lobed; *stamens* as in the bisexual flowers; *pistil* rudimentary, 2 × ¼ lin., tapering upwards, estigmatose.

FORM III. ♂ (called also *Mamoeiro macho*). This differs from

the last solely in the flowers being all ♂, or merely staminiferous, the terminal bisexual flower being either absent or uniformly abortive. *All the three forms are exactly alike in external appearance, and in the size and form of the leaves.*

Besides the observations on *C. papaya*, Senhor Mello has been able to make others, which follow, on the Jaracatiá (*C. dodecaphylla*, Vell. = *Jaracatia dodecaphylla*, A.DC.).

Trees (growing wild in the forests around Campinas) 20–30 feet high, erect, branched at the apex. *Leaves* digitate of 5–11 leaflets. I have not yet been able to verify my supposition that *C. 12-phylla* is polygamous, like *C. papaya*; for the only ♂ plant I had within reach was destroyed before it burst into flower; but among the buds that I opened, some had the style beginning to be divided at the point, which leads me to conclude that their ovaries would have been fertile. The style of the ♀ flower bears five suberect subterete stigmata (not cloven at the apex as in *C. papaya*); and the whole surface (except the dorsal furrow) is stigmatose. *A transverse section of the ripe fruit, made at whatever height, shows always five distinct and complete cells, formed by five fleshy septa* (the axes of the placentæ); *but the young ovary is 5-celled below, while above the middle there is only one cell, with five very prominent* placentæ, the ovules being attached to the faces of the placentæ, and not to the angle between them and the wall of the ovary. Hence it appears that the septa of this fruit are in reality the placentæ, which grow inwards as the fruit ripens, and finally meet in the centre, forming a spuriously 5-celled fruit *.

These observations of Senhor Mello show *Carica papaya* to be trioicous or trimorphous, and render it probable that all the other species occur also under three forms. The second

* Senhor Mello supposes that the four species of *Jaracatia* described in the 'Prodromus,' are really reducible to two, *J. spinosa* and *12-phylla* being forms of but one species, and *J. 7-phylla* and *Mexicana* of another species. He adds that he has never found more than eleven leaflets (5–11) in *12-phylla*, or more than five (3–5) in *7-phylla*. Further observation is certainly needed to prove that even *J. 7-phylla* is distinct from *J. spinosa*.

form is analogous to *Siphonia* (among Euphorbiaceæ) which has panicled racemes, each raceme terminated by a solitary fertile flower, while the rest of the flowers are males. Even in the ♀ plant of *C. papaya* it is only the terminal flower of each peduncle that is fertile, the rest having sterile ovaries*; so that, add anthers to these ovaries (sterile and fertile) and augment the number of flowers, and Form I. becomes Form II.; let the ovary of even the terminal flowers be sterile, and Form II. becomes Form III. It is almost certain that the terminal flower, even when bisexual, is not fertilized by its own pollen, but by that of the ♂ flowers; but we have no evidence on this head from Senhor Mello.

In the monograph of Papayaceæ in the 'Prodromus' (vol. xv. part i.) the author, M. Alph. DeCandolle (making, no doubt, the best use he could of his very incomplete materials) divides the genus *Carica* of Linnæus into three genera, whereof the first (*Papaya*) has a dextrorse æstivation and a 1-celled fruit, and the second (*Vasconcellea*, St. Hil.) is *supposed* to have a sinistrorse or else a straightly-valvate æstivation in conjunction with a 5-celled fruit. Out of the fifteen species referred to *Vasconcellea* only three are put in the section with a contorted æstivation; and of one of them (*Carica cauliflora*, Jacq.), it is said "æstivatio ignota." Now, as regards the first pair of differences, I had a distinct recollection of having seen in a living plant *flowers twisted in opposite directions on the same peduncle*; and I have verified it by an examination of Senhor Mello's specimens of *C papaya*. The real facts are these: the petals imbricate each other for about one-third of their width; in some flowers it is the *right* margin of each petal (*e centro floris visa*) which is imbricated by the adjacent petal; and the æstivation is "dextrorsum contorta;" in others, the *left* margin is similarly imbricated, and the æstivation is "sinistrorsum contorta." I examined three peduncles of the bisexual ♂ form. On No. 1 nearly all the flowers had a straight æstivation (*subrecte imbricata*); some were very slightly twisted to the left, and the solitary expanded flower was twisted to the right. On No. 2, no appreciable twisting of any of the flowers; but all had the *right* margin of the petals imbricated. On No. 3, the petals were either straight or

* Compare this with certain myrtles which have few- (say 5-) flowered peduncles—viz. two decussate pairs of stalked flowers, and a solitary terminal flower, which is always more precocious than the rest, and is the only one that produces a berry, although all are equally bisexual.

with a very slight twisting to the right; and an expanded fertilized flower had the petals quite straight and suberect.

The ♂ peduncles, however, had usually the *left* side of each petal imbricated by the adjacent one, and the *æstivation sinistrorse*. In a very few (chiefly but not uniformly axial) flowers it was dextrorse; and sometimes the two forms occurred on the same peduncle *.

The character on which St. Hilaire relied in founding the genus *Vasconcellea*, viz. the 5-celled ovary and fruit, appears, from Mello's observations, to arise from the placentas being more prominent in some species than in others,—so much so in some as to meet in the axis of the fully-formed fruit—precisely the same thing as occurs in many Cucurbitaceæ; and it is certainly not a constant concomitant of a sinistrorse or even of a valvate æstivation —a foregone conclusion of M. DeCandolle, to support which he is led to belie his authorities. Thus, of *Vasconcellea cauliflora* he says, "fructus unilocularis, ex Jacquin, *sed non credo*," and the same of *V. microcarpa*; and he throws doubt on Pöppig's saying that the fruit of *V. heterophylla* is 1-celled, with five parietal placentas. Moreover the habit is the same in all, and a quasi-5-celled fruit is the same externally as a 1-celled fruit.

The third genus, however (*Jaracatia*), will probably maintain its rank—the aculeate stem, the digitate leaves with distinct stipellate leaflets, and the union of the filaments into a short tube free from the corolla, appearing quite sufficient to substantiate it †.

Our materials are still far from sufficient to justify any one in undertaking to work up the order anew; and being myself unable

* I need scarcely mention that in the flowers of Apocyneæ, and in most others with a twisted æstivation, when the twisting is to the right, it is the right margin of each petal which *imbricates* (not *is imbricated by*) the adjacent petal; and similarly when it is to the left; but such is not the case in the Papaws.

† I do not see by what right modern authors have quashed the Linnæan name *Carica*, founded on the similarity of the foliage and fruit to those of the common Fig. Indeed, as we shall presently see, the early Spanish colonists called the trees "Fig-trees," and the fruit "Figs." The name "Papaya" is applied in Spanish America to only one (or two) species; and in Brasil it is not used for any; while throughout the Andes the larger species are called "Chambúru," and the smaller ones "Col del Monte" (Wood-cabbage).

If the difference in the æstivation be still deemed of generic importance, then the genera would stand as follows:—

CARICA, L. (=*Papaya*, DC., et *Vasconcellea*, § *Hemipapaya*, A. DC.): æstivatione imbricata, leviter contorta v. fere recta.

VASCONCELLEA, St. Hil. (=*Vasconcellea*, § *Euvasconcellea*, A. DC.): æstivatione inflexo-valvari.

to sit up to a table to examine specimens, I must be content to supplement this memoir with a short sketch of the ascertained distribution of the Papayaceæ, and of their history and properties, and with indicating what remains to be done before they can be monographed satisfactorily.

The 33 (or 35) species of which I have any knowledge, are thus distributed in tropical and subtropical America *:—

West Indies: 2 species—one still undescribed (an *C. citriformis*, Hook. non Jacq.?).

Coast-range of Terrafirma: 2 species (*cauliflora*, Jacq., and *microcarpa*, Poir.).

Mexico: 4 species †.

Andes of New Granada and Ecuador: 5 or 6 species.

Andes of Peru (chiefly eastern slope): 7 or 8 species.

Andes of Bolivia and Chili: 2 species.

Pacific coast (or coast valleys): 3 species.

SouthBrazil (chiefly near the Tropic of Capricorn): 4 (?) species.

Atlantic coast (and Amazon): 1 or 2 species (*spinosa*, Aubl., and *digitata*, Aubl.).

Cultivated—native country uncertain: 2 species (*citriformis*, Jacq., and *citriformis*, Hook.?).

Here we see the Papayaceæ *occupying a sort of ring around Guayana and Brazil—abounding towards the northern and southern tropics, along the Andes from Mexico to Chili, and on the Atlantic sea-board, but almost wanting to the immense included area.* Undiscovered species may still lurk in the mountainous region of central Brazil; but in Amazonia and Spanish Guayana I never met with a single truly wild species, either in the plains or on the hills. Whether the two prickly-stemmed species (or forms of one species) be truly wild in French Guayana, I know not. I never fell in with either of them, although *C. spinosa* is certainly sometimes planted near the towns on the Amazon, and Pöppig saw what he supposed to be *C. digitata* at Ega; but we know, from the testimony of Martius, Mello, and others, that those species, or others scarcely distinguishable from them, are certainly indigenous in Southern Brazil.

* In this enumeration are included, besides the twenty-five species described in the 'Prodromus,' eleven species seen (and most of them gathered) by myself in the Andes and on the Pacific coast.

† *C. nana*, Benth. Pl. Hartw., a Mexican plant, whose entire height is said to be only 3½ inches, and without leaves, is probably a shoot from an old stock, such as I have seen in *C. papaya*.

I suppose the West-India Islands to be the true native country of the common Papaw; for it was found there abundantly at the time of the discovery of America. Thence it had spread southward across the continent, along with the tide of emigration that seems to have continually surged in that direction from the earliest ages; for I have reason to believe that it grows nowhere wild on the mainland *. The earliest trustworthy account of it is in Oviedo's 'Historia General y Natural de las Indias' (lib. viii. cap. 33), which I have translated and condensed as follows †:—

"Of the tree which in this island, Hispaniola, they call *Papaya*, and in Terra-firma *Higos del Mastuerço*, and in the province of Nicaragua, *Olocotón*.

"In the western part of Terra-firma, in Veragua, and in islands adjacent to the coast, there are certain Fig-trees, tall, straight, and with a single unbranched trunk, which sends out at the top stout leaves, much broader than those of the Fig-trees of Castille, on stalks half a fathom or more long. The figs, which are as big as melons, are stuck on the upper part of the trunk in great numbers; they have a thin skin, and inside that a thick flesh, like that of a melon, only not so firm; it is well-tasted, and is cut into slices like a melon. In the middle are the seeds, in a mass the size of a hen's egg; they are small and black, and are enveloped in a sort of humour like that of the seeds of quinces, but more viscid. They are wholesome to eat, and have exactly the taste of Mastuerço (*Tropæolum majus*); while the fig without the seed is sweet; whence the Christians of Terra-firma call these fruits 'Higos del Mastuerço' [which is, as we might say in English, "Nasturtium Figs"] . . . . . Here [in Hispaniola] they are called 'Papaya,' and in the Government of Nicaragua 'Olocotón.' There is, even, a province, between the province of Nogrando and that of Honduras, which is called Olocotón, where there are many of these Fig-trees. They have a trunk as thick as a man's body, straight, and without a single branch; this is the common form; but there are others of the very same fruit which, when the trunk

* In the Eastern Peruvian Andes, near Tarapoto, at the height of 2000 feet, I have seen ♂ plants of *C. papaya* come up in a continuous growth covering some acres, upon a deserted clearing in the forest. It looked, when young, like a vast bed of hollyhocks; and when the plants had reached 10 feet high, they began to flower. Yet, although the seed had obviously fallen on a congenial soil, no truly wild plant was to be seen anywhere in that region.

† The first edition bears date 1535.

has reached the height of a man, put forth from one to as many as six branches—not spreading nor bent back, but straight and nearly as long as a lance, or sometimes twice that length.

". . . . . These straight shoots or branches bear at the top several stout leaves of a pleasant green, two spans or more broad, on stalks three or even six spans long. The trees bear fruit until they are five or six years old; but it grows smaller every year, and in the sixth year it is worthless. The figs ripen on the tree, not all at a time, but one by one; so that when the lowest is ripe and yellow like wax, the others are still green and hard." He concludes his account by saying that there are *two kinds of these Fig-trees*, one of which has long, and the other round fruit, although in the taste and everything else they are exactly alike.

What is this other kind "with round fruit," barely mentioned by Oviedo, but described by Rochefort ('Histoire Naturelle des Iles Antilles,' 2e éd. Rotterdam, 1665), and figured by him at p. 66, as a tree as stout as *C. papaya*, but with much smaller leaves "divisées en trois pointes" not unlike those of the Fig, and with roundish fruits, which, he says, are the size of a pear? On p. 67 is a figure of *C. papaya*, with its characteristic large deeply palmatifid thin inciso-pinnatifid leaves, and elongate-ob-ovoid fruit, "de la grosseur d'un melon, et de la figure d'une mammelle, d'où vient que les Portugais l'ont nommé *Mamão*," looking very distinct from the former, and said to be a much finer fruit. It is singular that our modern works contain no description which can be safely referred to this strongly marked trifid-leaved species from Martinique, Guadeloupe, and other of the Antilles; and I commend it for investigation to travellers and residents in those islands.

The ease with which the Papaw is cultivated, and the beauty and singularity of its aspect, have conduced—more perhaps than its large, luscious, but unsubstantial fruit—to render it a denizen of every warm country in the world. The fruit, although lightly esteemed by those who are new to it, is one of the most wholesome of tropical fruits. In South America it is eaten less as a dessert fruit than as a "fresco," or grateful "cooler," in the heat of the day, like water-melons and chirimoyas. It varies in flavour in different localities, being very insipid in some, but in others very sweet, as in the coast-valleys of Northern Peru. At Guayaquil the perfectly ripe fruit is still so milky that, after having been sliced and the seeds cleared out, it is usually put in water

a short while to allow the milk to be drawn away, which would otherwise scorch the lips like wild pine-apples. Not that this acrid and slightly bitter milk is unwholesome; on the contrary, its well-known anthelmintic property is perhaps the cause why eating the papaw-fruit is not known to produce ascarides, as indulgence in many other tropical fruits, such as mangos, is apt to do. Rochefort says it fortifies the stomach and aids digestion. He adds that a sort of marmalade was prepared from it, with sugar and spices, as it it is to this day *.

The fully grown but not ripe fruit is an excellent vegetable, cooked in the same way as vegetable-marrow, which it much resembles in flavour. Meat boiled along with it is thereby rendered tender—an effect probably owing also to the milk, which, according the analysis of Vauquelin, is a highly animalized substance, much resembling animal albumen. The same effect is said to follow from even hanging freshly-killed meat in the Papaw tree. This I have not seen tried; but I know that a tough parrot or macaw grows tender when wrapped for some time in the leaves, either before cooking or whilst being cooked.

The leaves have, besides, slight detergent properties, and are used in the place of or along with soap. In Venezuela a decoction of them is used to expel worms, in preference to the milk of the green fruit or of the trunk.

Fowls are very fond of the male flowers. I have seen them watch the day through under a tree from which every puff of wind brought down a shower of flowers, and fight for their possession.

Where Papayaceæ most abound is on the wooded slopes of the Andes, both on the eastern and western sides, up to 8000 feet

* The acridity of the milky juice is said to be excessive in some of the aculeate species, *i. e.* in the *Jaracatiæ*. What species is that spoken of by Pöppig under the name "Chamburu," which (he says) is looked on by the inhabitants of Maynas with as much dread as the Upas tree of Java, that the juice which spirted over him when he cut the tree caused itching on the face and blistered the hands, that the flowers smell of human excrement, and that the fruit is not touched by any animal but a sort of ant? There is probably here a little of that exaggeration whereof we travellers are not unjustly accused. I lived in Maynas for two whole years, and gathered there four species of *Carica*, but I never saw or heard of any possessing those deleterious properties. Pöppig supposes his plant to be the *Carica digitata* of Aublet, which Martius enumerates among those whose "fructus crudus assatus et coctus comeditur" (*Syn. Mat. Med. Veg. Bras.* p. 23).

elevation; and it is there that travellers and sedentary botanists may confidently expect to find not only materials for the more perfect elucidation of the species already partially known, but also many new species, which doubtless still remain hidden in the savage recesses of the oriental Andes. They delight to grow on stony springy hill-sides, and on little plateaux, under the shade of loftier trees. They can scarcely be considered common plants; and it is not often that many individuals of one kind grow near each other; but on the south-western side of the volcano Tunguragua, at the foot of the cascade Guandisagua, and near where its waters join the river Puela (at 7000–7500 feet), there are perfect groves of Chambúru—the common *Carica* of the Equatorial Andes, where it is cultivated up to 9000 feet for the sake of its edible fruit. When I visited the spot, in February 1858, the ground was strewed with its ripened and rotting fruits (smaller and sweeter than those of the cultivated plant), which are said to be a favourite food of the bears that infest the forests of Tunguragua. This Chambúru has a trunk as stout as that of the common Papaw; and the leaves are even still larger. The fruits are 8 or 9 inches long, and sometimes nearly as broad; the flesh is whitish (not yellow, as in the Papaw), soft, and with a pleasant flavour—in cool sites sometimes very acid. Velasco says ('Historia Natural de Quito,' p. 58), with a little exaggeration, "Es de las frutas de mayor y suavisima fragancia, bastantemente dulce, de bellisimo gusto." Even this comparatively common species I cannot identify with any described one.

On the northern side of Tunguragua, towards the head of the tepid stream Baccún, I came upon four distinct species of *Carica*, growing together with Tree Ferns, two or three kinds of *Citrosma*, *Higginsia latifolia*, and other shrubby plants, under the shade of tall Laurels, *Weinmannia glabra*, L. f., *Turpinia venosa*, sp. n., Dragon's Blood (a lofty tree, with a stout buttressed trunk, apparently an undescribed *Croton*), a handsome Rubiaceous tree (*Joosiæ* sp., hb. 5195), and other forest-trees; while the course of the Baccún was marked by red patches among the trees, arising from the rigid ferrugineo-tomentose foliage of *Freziera lanata*, R. et P. Three of the *Caricæ* rose to trees, one them 40 feet high; the other two barely exceeded half the height; and the fourth (on which I saw only decayed remnants of fruits) was no thicker than a walking-stick, and barely 6 feet high. When I came upon them, I and my attendant were already laden with specimens; so that I had to content myself with a very few spe-

cimens of each *Carica*; and when, some weeks afterwards, I found time to revisit the spot, a deluge of rain compelled me to limit my gatherings to ferns and mosses *.

The *Caricæ* that I have met with elsewhere in the Andes grew much more dispersedly. They are all small arbuscles, but often have ample foliage, which the natives boil and eat under the name of "Cabbage" (Col del Monte); and their fruit is a small scarlet or yellowish berry about an inch in diameter—in some species 5-celled, in others 1-celled; but all these species have a valvate æstivation. Three of them grew in the Andes of Eastern Peru (*i. e.* Maynas), and two others in the Chinchona forests of Chimborazo. I add at the foot extracts from my scanty notes on two of these plants, which may assist in identifying them †.

The handsomest species I have seen is one which I have distributed under the name of *Carica* (*Vasconcellea*) *paniculata*, sp. n., no. 6460. It grows at the level of the sea, in latitude 1½° S., in hollows on the desert coast of Chanduy, along with a few other

* Specimens of the leaves and flowers of three of these *Caricæ* are deposited at Kew. The fruits I was unable to preserve; but I made a note of their characters, which I here subjoin, to aid in determining the species:—

No. 5190, ♀. Arbor trunco simplice, tenui, flexuoso, 20-pedali . . . . . . Fructus diametro vix biunciali, globoso-turbinatus, apiculo brevi, obscure pentagonus, angulis a basi ad medium usque depressis, a medio ad apicem elevatis, 5-locularis, pericarpio carnoso, 3 lin. crasso. Semina pauca, dissepimentis præcipue angulis parietalibus affixa, 4 lin. longa, anguste ovalia, muricibus majusculis sub-6-seriatis obsessa.

No. 5191, ♀. Arbor 25-pedalis, diametro 9 unc., subramosa . . . . . . Fructus (vix maturus) $2{\cdot}3 \times 1{\cdot}5$ unc. ovato-fusiformis pentagonus, angulis latis obtusis, faciebus depresso-planis . . . . . . Semina ut in priore, crebrius muricata.

No. 5192. This species grew to a tree of 40 feet, branched upwards; and the one I cut down was a male. All three species are very distinct in their foliage.

† No. 4345, ♂. *Carica heterophylla*, Pœpp. (sec. cl. Bentham).—*Hab.* Andes Peruvianas, in sylvis montis Campana. Suffrutex 4-pedalis, basi sola ramosus. Folia 6–8-uncialia, pallide viridia, *venis albis*, basi cordata, alia integra, alia basi 1-lobulata, alia pinnatim 5-partita. Flores pallide virides, 5-meri, in cymos axillares longissime pedunculatos dispositi. Corolla hypocraterimorpha, tubo elongato tenui, limbo e laciniis angustis valvatis.

No. 4387, ♀. *Hab.* Cum pr. etiam in M. Guayrapurina. Arbuscula mollis, simplex, supra medium foliosa. Folia magna, 5-partita, laciniis profunde lobatis, lobis oblongis cuspidatis acutis; petiolo succulento, 12–15-unciali. Racemi axillares, pauciflori. Flores luteo-virides, 5-meri. Calyx minimus. Petala linearia, valvata, basi ipsa coalita. Stigmata elongata subteretia . . . . . . Bacca luteola, succulenta, globosa, diametro unciali. Semina plurima, albuminosa; embryone majusculo, cotyledonibus foliaceis.

shrubs that withstand the long drought; and its naked wand-like stems, 9 feet high, stand up like dead sticks, until the rains (which are not usually more than one or two showers in the whole year; and there have been years without any rain) revivify them, and they become clad at the growing apex with large deeply-cut leaves, whose veins and long petioles are usually crimsoned over, and from whose axils spring the pretty *red* flowers, which, in the male plant, are disposed in corymbose panicles.

To sum up. Scarcely any of the Papayaceæ can be called "well known." Of very few of them do our herbaria contain specimens of more than one sex; and the inflorescence of even the commonest species has not been traced through its various phases until recently by Senhor Mello, who, it is to hoped, will continue his interesting investigations, not only on the Papaws, but on all the plants within his reach which, from their bulk or their perishable nature, cannot be thoroughly studied from dried specimens.

If, in the preceding remarks, I have presumed to comment on the labours of so eminent a botanist as M. de Candolle, I will allow him (*en revanche*) to exclaim against those travellers (myself amongst the number) who have furnished him with such incomplete materials. If he will take the trouble to refer to the accounts of the sufferings of Gonzalo Pizarro and his followers, and those of Madame Godin des Odonnais, in the terrible forest-deserts of the "Land of Cinnamon" (*i. e.* of the eastern side of the Equatorial Andes), he will comprehend how often the traveller, whose energies are severely tasked to barely keep alive, is compelled to pass with a sigh the fine things he is unable to gather, much less to preserve, and how the few specimens he does contrive to dry, amidst perpetual rains and privations of every kind, however incomplete they must often be, are very precious in his eyes, although the botanist who writes about them cannot and ought not to estimate them at more than their real worth. One word more. If the high priests of our science would be content to wait until they obtain complete specimens of the plants they describe, and not be so eager to baptize in their own name every discoloured fragment that disfigures their herbaria, their writings would gain in precision and completeness, and ensure their claim to the honour and gratitude of all posterity.

R. S.

January 3, 1867.

Note.—Mr. Hanbury has pointed out to me that the second or monoicous form of *Carica papaya* is plainly indicated by Piso (Hist. Nat. et Medic., Amstelædami, 1658) in the 23rd chapter of his 4th Book, headed "*Pinoguaçú* mas et fœmina, et *Jaracatiá*," the native names of Papaw being, as the author afterwards explains, *Pinoguaçú* and *Papay*, although the Portuguese have called it *Mamoeiro*. According to Piso, if a *male* tree be transplanted about its third year, it generally brings forth a few fruits; and his figure (p. 160) represents such a fruit-bearing male, the fruits being pendulous therefrom on long peduncles, precisely as described by Senhor Mello; and he makes the following comment on the fact:—"Hence it is false that the males do not bear fruit, as also that the females do not bear fruit except by communication with the male; for repeated experience has shown the contrary; but the fruit of the male, when it is produced, hangs downwards on a long stalk." ("Falsum porro mares non ferre fructum, uti et fœminam non ferre fructum nisi mas adstet; contrarium enim multiplex experientia docuit; fructus vero maris quando nascitur pendiculo illo longo pendulus est deorsum versus, &c.," Piso, *l. c.*) The fruit (he adds) is smaller and slenderer than in the female plant; and the flesh is paler and not quite so palatable.

It is worthy of Senhor Mello's further inquiry whether the male plants which he has found bearing fruit have acquired that property by transplantation, or by some other accident of growth, which, by arresting the lateral development of the peduncles, has concentrated the nutriment in the axial flowers, thereby rendering their otherwise abortive ovary capable of being fecundated.

The name *Pino-guaçú*, *i. e.* Great Nettle, has probably been applied by the Brazilians to this plant from the similarity of its leaves to the large deeply-jagged foliage of some tropical Nettles. I have not myself heard it used. The name *Papaya* originated with the Caribs of the Isles; and I have heard it variously pronounced by their descendants on the Orinoco and elsewhere, *Papaya*, *Mapaya*, and *Mamaya*. Humboldt supposes it derived from the Maypure (and Carib) word for "honey," viz. *Mapa*; for the sweet taste of the fruit may be likened (he thinks) to that of honey.

R. S.

DESCRIPTION OF PLATE I.

Fig. 1. Flowering peduncle of a polygamous plant.
Fig. 2. Bisexual flower of the same.
Fig. 3. Ovary of a bisexual flower.
Fig. 4. Ovary of a ♀ flower, from a female plant.
Fig. 5. A ♂ flower, from a male plant, having the petals imbricating towards the right, but twisted towards the left.
Fig. 6. Another ♂ flower, from the same peduncle, having the petals imbricating towards the left, but twisted towards the right.

On the Cultivation of *Cinchona* in the East Indies. By JOHN ELIOT HOWARD, F.L.S.

[Read Feb. 21, 1867.]

THE examination of a recent remittance of the barks of different *Cinchonæ* grown in the Government plantations at Ootacamund has afforded several results of botanical interest, as well as those feelings of satisfaction with which the progress of a great national experiment conducive to the welfare of mankind must ever be regarded. The specimens of bark were removed from the trees in September and October 1866 by Mr. M'Ivor, under whose care they were grown. I beg the Society's acceptance of a copy of the report of a chemical examination of these, which I have made to the Indian Government, and which indicates a very cheering progress in the cultivation.

The important deduction which appears to be legitimately derived from the above examination is the necessity of carefully distinguishing between the different forms of allied plants which it is intended to cultivate. Whether these forms be looked upon as species or varieties, it will be seen that it is of vital importance to the success of the experiment that only those plants should be multiplied which are capable of giving a good result in their yield of alkaloid, and that those sorts should be rejected which are unsusceptible of improvement.

The *Cinchona officinalis* and its varieties offer the first confirmation of the above. The Linnean term was most correctly (in my opinion) restored by Dr. Hooker to the species described and figured by M. la Condamine, the bark of which also corresponds with that examined by Linnæus as received from the collection of M. Seba, his friend. A specimen of the bark of this species is now before the Society. It was received by myself in 1859, from

Don T. Riofrio, himself a native of Loja, together with flowering branches and capsules full of seeds of the same plant, from the mountains of Uritusinga, whence the Spanish botanist, Pavon, derived his name for the species. These seeds, having vegetated under my care, I was enabled to present a plant to the Indian Government, from which, up to February of last year, 8219 plants had been derived.

This is the *C. officinalis* of Dr. Hooker. In India, according to a "Memorandum" in the return (ordered to be printed 18th of June, 1866), it is called *C. officinalis*, var. *Condaminea*; and the other sorts there grown are to be named var. *Bonplandiana* and var. *crispa*.

It seems to me that if any designation is supplemented to the simple *C. officinalis*, it should be that of Pavon (locally descriptive), var. *Uritusinga*. This would be generally understood, as the name is still in constant use.

In the next place, the species is certainly not either of the forms figured in the 'Plantes Equinoctiales;' and therefore the designation var. *Condaminea* is incorrect and tends to confusion, a confusion which already begins to be evident in India; for in several of the returns all the varieties of Loja-bark are called "*Condaminea* and its varieties," all being classed together. Now, some of these are proved to be suited to peculiar climates, and should therefore be discriminated. The *C. officinalis* seems specially suited to the climate of the sub-Himalayan aspects (as Darjeeling), as also to Ceylon. The var. *crispa* is specially suited to the summit of the Neilgherries, but seems to abound rather in colouring matters than in the alkaloids peculiar to these Barks.

The "Memorandum" states correctly that the *C. Chahuarguera* of Pavon is the plant represented in the unshaded branch with capsules in plate x. of the 'Plantes Equinoctiales,' and therefore provides that it shall bear the name of Bonpland, and be the variety *Bonplandiana*.

But the above plant, the *C. Chahuarguera* of Pavon, is not known at present in India. It is the original source of the "Rusty Crown Barks" of English commerce. I should then call this *C. Chahuarguera* of Pavon the var. *β. Condaminea*.

The plant to which the "Memorandum" attaches the name is the var. *colorada del Rey* of the *C. Chahuarguera*, according to Pavon; and if it is represented, as I think, by the bark which I examined, it is a great success, and must be carefully distinguished by the cultivator. It is represented by an original specimen of a

flowering branch brought by Mr. R. Cross with the seeds which he collected for India. This is now before the Society. I should call this the var. *Bonplandiana*, adding the descriptive term *colorata* or *lutea*, according as we have to do with the form called *colorada del Rey*, or the *amarilla del Rey*, which last is not, I think, known in India.

The var. *crispa* may retain its name, which is descriptive. It is singular that the distinctive properties of the bark should so permanently outlive the change of soil and climate, and also that whilst the *colorada del Rey* has so greatly improved, this is the case in small degree with the var. *crispa*. The nomenclature would thus be free from contradiction, which it is not at present; and the names both of La Condamine and of Bonpland might be retained with complete consistency.

The remarkable plan of successful cultivation by renewal of the bark, in reference both to the *C. succirubra* and *C. officinalis*, var. *Bonplandiana*, has long been practised at Loja, as will be found by the details given to me by Don T. Riofrio, and recorded in my 'Illustrations of the *Nueva Quinologia*' under the head *C. uritusinga*; but Mr. M'Ivor was the first, so far as I am aware, to save the plant itself from the injurious results of the process. A drawing under the microscope, by Burgess, will show the anomalous formation of the bark in these *Cascarillas resacadas*.

As regards the bark of *Cinchona Pahudiana*, the results are new and striking. It appears, as I have said elsewhere, to indicate a sort of mean between the extreme depreciation in which it has been held by some parties and the commendation lavished on it by others. I lay before the Society specimens showing, as I apprehend, the entire distinctness of the plant from the *C. Carabayensis* of Weddell, and its derivation from the *C. orespilla chica* of Hasskarl, by whom it was introduced into Java. It appears to be rather superior in point of produce of alkaloid to the fine bark of Loja (*C. crispa* or *Quina fina*) as grown in India.

The variety *frutex* of the *Calisaya*, as grown in India, does not, I think, deserve to be cultivated. I have expressed myself so fully on this point, in a communication to the Botanical Congress of 1866, that I need not add much here. I have great hopes of the produce of the seed recently introduced from the best province of Bolivia as yielding one or more sorts of *Calisaya* rich in quinine, and repaying to the cultivator. The var. *frutex* seems rather to deteriorate than to improve in India.

In conclusion I cannot avoid expressing my gratification at the

success which appears to be resting on this great and arduous national undertaking, and my desire that the cultivator should not rest on any one species exclusively, but that a wise selection should be made of those which have been proved to be most advantageous, and that all the remaining species which promise well should by degrees be added to those now under cultivation.

On some points in the Morphology of the Malvales, together with a description of a new genus of *Buettneriea*. By M. T. Masters, M.D., F.L.S. &c.

(Plates II. and III.)

[Read Dec. 20, 1866.]

Having, through the kindness of Dr. Hooker and Prof. Oliver, been entrusted with the task of working up the *Malvaceæ* and allied Orders of tropical Africa, I have necessarily had to examine the structure of the flowers in a large number of the genera of these Orders. The floral arrangements are so peculiar, that they have attracted great attention on the part of morphologists, and they are so distinctive that there has been very little difference of opinion among systematists as to the intimate relationship existing between the various members of the group. While some botanists have classified the plants in question under the heads of several families, e. g. *Malvaceæ*, *Bombaceæ*, *Sterculiaceæ*, *Buettneriaceæ*, &c., others have combined them into fewer and larger groups, as has been done by Bentham and Hooker ('Gen. Plant.' i. p. ix*), who, under the head of their "Cohors VI. Malvales," include three orders, viz. *Malvaceæ*, *Sterculiaceæ*, and *Tiliaceæ*, a group corresponding to Lindley's Malval alliance, but improved by the removal of *Tropæolaceæ* and *Vivianaceæ*.

Although, for convenience' sake, it may be desirable to retain the Order *Sterculiaceæ* as distinct from *Malvaceæ*, yet the two groups are so intimately connected in their morphological construction, that it is hardly possible to comprehend the peculiar structural arrangements of the one, without comparing them with the corresponding parts in the other.

Moreover the one-celled anthers of Mallows proper really afford

* See also Bentham in Journ. of Linn. Soc. 1862, vol. vi. p. 97; and Bocquillon, 'Sur le Groupe des Tiliacées,' p. 46 (Adansonia, vol. vii. p. 17).

no intrinsic distinction from those of *Sterculiaceæ*, the anthers of the Mallows being, in the first instance, truly bilocular.

I propose, in this communication, to allude to some of the more salient features in the structure of the *Malvaceæ* and *Sterculiaceæ*, omitting for the present the *Tiliaceæ*, and proceeding from the most simple cases up to the most complex. I hope to be able to show how all these forms may be linked together, and in what manner their peculiarities may be referred to the ordinary type.

Of the calyx and epicalyx it is not necessary to say much, as their modifications are few, and, for purposes of mere classification, comparatively unimportant. In order to arrive at a correct understanding of the corolla, it is necessary to consider it in connexion with the andrœcium. Taking, then, the petals with the stamens, we find in the Malvales that these organs are of the greatest importance for classificatory purposes. Not only does the connexion of the stamens furnish one of the best characters of the entire group, but even in the discrimination of smaller subdivisions (such as the genera) the appearances presented by the "column" are of the greatest value, as the characters thence derived exceed in number, in constancy, and in relative importance those obtained from the other parts of the flower.

A glance at the characters of the genera will suffice to show the truth of this assertion. The main points to which I intend to refer in this communication are the following:—the occasional total absence of the corolla, as in *Sterculia*, in which genus it often happens, as if by compensation, that the calyx is brightly coloured; the imbricated and twisted æstivation of the petals, except in *Buettneriеæ*, where they are valvate or induplicate, their very general adhesion to the stamens, the generally large number of the latter organs, their cohesion in various degrees, and their superposition to the petals.

The presence or absence of staminodes is also a feature of considerable importance.

By attention to these points (which by no means constitute the whole of the peculiarities of this remarkable group) it is possible, I think, to arrive at a satisfactory explanation of the morphological construction of the corolla and andrœcium. And first as to the absence of the corolla, as in *Sterculia*, *Cheirostemon*, *Fremontia*, &c.

In *Sterculia* the number of stamens and their arrangement is such that, in the fully developed flower at least, it is not possible to make out accurately their exact position with reference to the lobes of the calyx; but in *Fremontia* the stamens alternate with

the sepals, as they seem to do also in *Cheirostemon*. In the latter plant the anthers are all turned to one side, in the same way as the petals of a ligulate corolla. Considering, from a recent examination of living specimens, that the andrœcium of *Fremontia* and *Cheirostemon* is really pentandrous, an opinion now entertained by Dr. Hooker (see Bot. Mag. 1866, tab. 5591), and not decandrous as formerly supposed, the arrangement of the sepals and stamens, in the plants just named, may be expressed as follows:—

s s s s s
st st st st st

In *Waltheria* there are five petals and a column of five united stamens, which latter are clearly antipetalous.

This arrangement may be symbolized in the following manner:—

s s s s s
p p p p p
st st st st st

s s, representing the sepals; p p, the petals; st st, the stamens placed in front of the petals.

In *Bombax*, *Eriodendron*, &c. the stamens, instead of being simple, are compound, the five antipetalous bundles representing, not so many groups of distinct stamens, but five originally simple stamens each split up into many subdivisions. This may be represented as follows:—

s s s s s
p p p p p
sts sts sts sts sts

In *Sidalcea* the stamens are in two rows, and show a tendency to become united into phalanges; or, more properly speaking, there are ten compound stamens in two rows, five outer antipetalous groups alternating with five inner sets. The formula for this would be—

s s s s s
p p p p p
sts sts sts sts sts
sts sts sts sts sts

In *Hibiscus* and some other genera the staminal column is terminated by five teeth or staminodes, which represent probably the inner staminal whorl of *Sidalcea*. This arrangement is shown by the following symbol, × × denoting the staminodes:—

s s s s s

p p p p p

sts sts sts sts sts

× × × × ×

In *Pavonia*, on the other hand, according to Payer, the sterile teeth of the column are antipetalous.

In *Dombeyeæ*, and in some other tribes, well-defined staminodes occur, these staminodes being usually five in number and antisepalous; even in *Melhania*, where a staminode and a stamen appear to be placed in front of each petal, it has been well remarked by Bentham that they are not placed in the centre of the petal (Journ. Linn. Soc. Bot. vol. vi. p. 119). This arrangement occurs in *Rulingia* and other genera, and may be represented thus:—

s s s s s

p p p p p

× st × st × st × st × st

In *Dombeya* and *Pterospermum* &c. there are fifteen stamens in five antipetalous groups, there being between each group of three stamens one staminode, thus—

s s s s s

p p p p p

× 3 sts × 3 sts × 3 sts × 3 sts × 3 sts

In *Kleinhovia*, *Buettneria*, *Theobroma*, and some other genera, including *Scaphopetalum*, a new genus from West Equatorial Africa, a description of which is hereto appended, there are likewise three antipetalous stamens, partially concealed within the concavity of each of the petals, and alternating with staminodia of various forms, but which are always five in number and almost invariably antisepalous in position. In the tribe *Buettnerieæ* especially, and in some other genera, the petals are not only concave but marked with very prominent nerves, as are also to a less extent the sepals. In the new genus to which I have referred, the cellular tissue between the nerves is relatively so abundant that it is thrown into folds forming longitudinal furrows between the ridge-like nerves. The same peculiarity exists to some extent in the sepals of these plants.

In *Glossostemon* the arrangement is yet more singular. In this plant there are five sepals, five petals, five staminodes, and thirty stamens, the position of which is variously described by different authors. Endlicher (Gen. Plant. p. 1003. no. 5350) describes ten of them as adnate to the base of the staminodes, "*decem filamentis*

sterilibus contigua, iisdem usque ad medium adnata." Bentham (Benth. et Hook. Gen. Plant. p. 224, no. 26) describes them as "*Stamina * * * pluriseriatim connata,* 5 *intima ananthera (staminodia) anguste petaloidea acuminata cum petalis alternantia, antherifera* ∞, *interiora staminodiis basi adnata, cetera sub* 4*-natim cum staminodiis alternantia,*" &c.

Neither of these descriptions appears to me to be strictly correct; but not having examined living specimens in various stages, I would wish to express myself with diffidence upon this point. It appears to me, from the dissection of dried flower-buds, that in this plant there are five staminodes placed opposite to the sepals (antisepalous as usual), and that on each side of the staminode there are three perfect stamens, not adnate to it but really forming part of it. I consider, then, that in this plant there are five compound stamens, the central lobe of each of which is petaloid and traversed by a central prominent midrib, while the three (sometimes four) lobes on each side of the central one are filamentous, and surmounted each by a perfect anther*. According to the view taken by the authors I have cited, there would be two rows of stamens—an outer wholly fertile, an inner partly sterile, partly fertile. But so far as I am able to judge, there is but one row of stamens, the apparent existence of two rows being accounted for by the revolution of the margins of the compound staminal leaf, which thus is somewhat concave, the concavity being turned outwards, so that the anthers are thrust into the concavity of the petals. Even supposing there were two rows of stamens, the law of alternation would still be interfered with in this case, as the staminode is unquestionably antisepalous.

Whether in *Glossostemon* there are two rows of stamens, or, as I believe, only one, is a point that can only be definitely decided when the organogeny of the flower shall have been studied; but assuming the correctness of my interpretation of its structure, the question arises whether or not in some other of the Malvales where there are apparently two or more rows of stamens, that appearance is or is not fallacious. In *Sidalcea* it can hardly be so; in

* Mr. Bentham himself seems at one time to have arrived at the same conclusions as to the structure of this plant (see Journ. Linn. Soc. Bot. vol. vi. p. 119); but in the 'Genera Plantarum,' as already stated, the andrœcium is differently described. In the Tiliaceous genus *Leptonychia* a somewhat similar arrangement prevails. In this plant on either side of the staminodes which are superposed to the sepals are two stamens—one fertile, the other destitute of an anther.

that genus, and probably in others, there are really two or more rows of stamens; and I may here remark that, in *Malope*, the stamens, after the shedding of the pollen, arrange themselves in vertical ranks, a pair of which alternate with the petals and present an arrangement precisely similar to that of the stamens in the bud of *Glossostemon*, where opposite each sepal, and therefore between two petals, the stamens may be seen arranged in two vertical ranks, each rank consisting of three stamens one above the other, so as to give an impression at first sight as if there were three rows of stamens: the arrangement in *Glossostemon* may be represented as follows:—

s		s		s		s		s	
	P		P		P		P		P
st st		st st		st st		st st		st st	
st st		st st		st st		st st		st st	
st st		st st		st st		st st		st st	
×		×		×		×		×	

From this it will be seen that the three anthers on each side of the petal belong to two different groups; and, after macerating the flower of *Glossostemon*, the staminode may be readily separated with the three fertile stamens on each side of it; and owing to the revolution of the margins, as before stated, the anther-bearing filaments, or some of them, appear to be on a plane external to that of the staminode. It may here further be remarked that the nervation of the staminode with the stamens attached to, or rather branching from it, and that of the petals is identical; in both instances there is a prominent midrib with three smaller ribs on each side of it; in the petal these six lateral ribs converge towards the acuminate end, and are connected together by intervening cellular tissue, while in the stamen the central rib alone is covered with cellular tissue, forming the staminode, the six lateral ribs being free, divergent, and surmounted by anthers. The carpels of *Glossostemon* are five in number, so that the entire floral arrangement may be represented by the following formula, c denoting the carpels:—

s		s		s		s		s	
	P		P		P		P		P
3 sts × 3 sts		3 sts × 3 sts		3 sts × 3 sts		3 sts × 3 sts		3 sts × 3 sts	
	c		c		c		c		c

The illustrations given will apply to most of the modifications presented by the petals and stamens in the group *Malvales*; and in order to explain them, it is desirable to have recourse not only

to analogy, as has been done by Asa Gray, Bentham, and others, but also to organogeny, as studied by Payer, Duchartre, Baillon and A. Dickson. Unfortunately the latter writers are not in accordance one with another on all points. Duchartre* considers that the petals and stamens of Mallows are identical in their origin, being developed from five papillæ, alternate with the sepals; and that each papilla in process of time divides so as to give origin to a petal and a cluster of stamens, the union of the five clusters forming the column. This view receives the support of Asa Gray†, who cites in its favour the case of *Sidalcea*, before mentioned.

Payer‡ dissents from the conclusions of Duchartre, and asserts that the petals originate earlier than, and distinct from, the stamens, and moreover that the latter organs are developed centrifugally, *i.e.* from the centre to the circumference, and not from the circumference to the centre, as stated by Duchartre. The appearances in the young bud of *Glossostemon* conform with the views of Payer, as the staminode is in advance of the stamens in its development, and of the stamens that are attached to it the uppermost are evidently developed first; so that, assuming the staminode, with the stamens, to be the analogue of a digitate leaf, the central lobe or staminode is developed first, the lateral lobes or fertile stamens subsequently, and in regular order, from above downwards, as appears to be the general rule in the case of compound stamens. All observers seem to be agreed that the fertile stamens originate in front of the petals, and not alternately with them; so that there is really or apparently an exception to the law of alternation. There are several ways by means of which this anomaly may be explained; but as they are for the most part of a hypothetical nature, I shall merely indicate them briefly.

In the first place, then, the opposition of the stamens to the petals may be accounted for on the supposition that an outer row of stamens is suppressed; but, in the majority of instances, the existence of this outer row is purely hypothetical, while in those cases (such as *Glossostemon*) where a second row is considered by some to exist, the law of alternation is still interfered with, as the inner row (the staminodes) is placed opposite to the sepals, and not opposite to the petals, as it ought to be. In the next place, it is possible to arrive at an explanation of the

* Ann. Sc. Nat. 3rd ser. vol. iv. p. 123. † Gen. Flor. Am. vol. ii. p. 45.

‡ 'Traité d'Organogénie Comparée de la Fleur' (1857), p. 29, tab. 6, 7, 8. See also Baillon, 'Adansonia,' vol. ii. p. 166.

structure in question by considering the petals to constitute a portion of the andrœcium, and not a true corolla, just in the same way as the petals of *Rosaceæ* are considered by Dr. Alexander Dickson to belong to the staminal whorl*; and this notion is indirectly supported by the frequent absence of the corolla in *Sterculia*, or its minuteness, as in *Guichenotia* &c. But this view is not borne out by organogeny, it being pretty clearly ascertained that the petals and stamens are distinct in their origin, and that the former precede the latter in their development. This original separation of the two whorls also precludes the acceptance of a third hypothesis, that the stamens are produced from the petals by chorisis or *dédoublement*.

The hypothesis which appears to me to have the greatest amount of support from comparative morphology or analogy, is one according to which the key to the whole structure would be afforded by the presence and relative position of the staminodes. These are generally five in number, and almost invariably opposite to the sepals, thus occupying the normal position of the stamens. Payer, indeed, states that, in *Pavonia*, the sterile teeth of the column are antipetalous, an assertion of the truth of which I have not been able hitherto to convince myself, though in some *Tiliaceæ* the staminodes are superposed to the petals. But even if it be so, the probable existence of more than one row of stamens in this genus would still leave my hypothesis unaffected. I consider that the central lobe of the staminal leaf is placed almost invariably, if not always opposite to a sepal, that sometimes this central lobe is fertile, *i. e.* antheriferous, and then it does not differ from the ordinary stamens; at other times it is sterile and petaloid, always traversed by a central rib, and then receives the name of staminode. Such a case as *Waltheria*, where there is a single stamen in front of a single petal, may be explained by the partial suppression of the central and of one of the lateral lobes of the stamen, one lateral filament alone being developed. Traces of the suppressed organs may, indeed, be seen in young flower-buds at the very base of the flower; and it is probable that they would be more clearly seen in fresh flowers; at any rate it is easy to see that the stamen is not exactly central. Moreover, although, as a general rule, where the staminode is immediately in front of a sepal and has on each side of it one, two, or more stamens it may be considered to represent the terminal or central lobe of a digitate leaf, yet in other cases it may be that the

* Seemann's Journal of Botany, vol. iii. p. 216.

staminode represents one of the lateral rather than the terminal lobe. This notion derives support from the exceptions to the rule. Thus in *Sparmannia* and *Honckenya*, Tiliaceous genera, the anantherous filaments are external, corresponding to the lateral lobes of a leaf, and as such they may be and are indefinite as to number, while in those cases where the staminodes are internal they are always definite in number.

Such an instance as *Dombeya*, where there are fifteen stamens placed in groups of three between each staminode, presents a difficulty that I can only explain by what is a mere assumption, but still one that is, I believe, quite legitimate, viz. that only a portion of each staminal leaf is developed, and that there should be three more stamens on one side of the staminode, so as to render it like that of *Glossostemon* before referred to. If the twisted and very oblique petals of *Dombeya* be borne in mind, there will be no difficulty in supposing that a similar inequality of growth may have taken place in the stamens. The explanation here offered corresponds closely with that given by Mr. Bentham, in his "Notes on *Malvaceæ* and *Sterculiaceæ*," to which I have often referred in this communication, and is, I believe, in greater conformity with the facts recorded by morphologists and organogenists than any other. That it is open to some objections is obvious; and many of these cannot be removed till the organogeny of the group is known. I may here add that the view I have taken serves to explain the structure of some double flowers in this order, otherwise very puzzling. In some double Hollyhocks, *Althæa*, *Hibiscus*, &c., there is an appearance as if tufts of petals originated from the column, the face of one petal being placed opposite to the face of another petal, the two being separated by a crowded mass of smaller petals, so that the appearance of the whole is very much as if a series of axillary buds had been formed within the primary petals,—against which view, however, it may be stated that there is no calyx and no pistil in these apparent buds; moreover in some semi-double flowers the nature of the case becomes obvious, and it may be seen that some of the petals of the tuft correspond to the staminodes of *Dombeya* &c., others in the same tuft to the fertile stamens, and others to the petals. In truth, a diagrammatic section of the flower of some of these semi-double *Hibisci* is identical with that of *Dombeya*, with the exception that the fertile divisions of the stamens are, in the case of the semi-double flower, replaced by petaloid expansions *.

* The staminodes would seem in some cases to have not merely a morpholo-

As to the pistil, it is subject to many modifications. As examples may be mentioned the unilocular (by abortion) pistil of *Waltheria*, the verticillate pluricarpellary arrangement of *Malva*, *Abutilon*, while in *Malope* and other genera the carpels are arranged in convex heads, very different in outward appearance from the capsular-fruited genera, such as *Hibiscus*, the indehiscent pods of *Adansonia*, or the succulent-fruited *Malvaviscus*. Generally the number of styles corresponds to the cavities of the ovary; but in *Pavonia* there are twice as many styles as loculi. In those instances where the carpels equal the sepals in number, they are sometimes placed opposite to the sepals, as in *Melhania*, *Hermannia*, *Dombeya*, *Cheirostemon*, *Senra*; but more generally they alternate with the sepals, *e.g.* *Melochia*, *Urena*, &c.

The variation in number of the carpels may be accounted for, as Dr. A. Dickson has suggested, by considering the carpels to be compound, like the stamens; and the diversity in relative position may be satisfactorily explained by supposing that the antipetalous carpels are developed in some cases, the antisepalous ones in others, *Pavonia* affording an illustration of an intermediate condition in which the perfect carpels are sometimes antisepalous, and the abortive ones (represented by the styles only) are antipetalous; at other times, in other species of the genus, the converse arrangement occurs*.

On Scaphopetalum, *a new Genus of* Buettneriese.

AMONG the many interesting plants collected by Mann in Western Equatorial Africa (lat. 1° N.) are representatives of three species, constituting, as I believe, a new genus of *Buettneriew*, closely allied to *Theobroma*, but distinguished from it and other neighbouring genera by the absence of an appendage to the petals. The late Mr. Allan Black had noted in the Kew herbarium that two of the species now to be described belonged to a new genus "near *Myrodia*;" but he does not appear to have affixed a name to the genus, or to have published any notes concerning it. As considerable interest attaches to the plants, both in a morphological point of view and also with reference to geographical distribution, I avail myself of the present opportunity, with the

gical interest, but to be of physiological importance, if I may judge from what takes place in a species of *Dombeya* (*D. Mastersii*, Hook. B. M. tab. 5639), where the staminodes appear to wipe out the pollen from the anthers and convey it to the stigmas. See Gardeners' Chronicle, 1867, p. 14 (sub *D. angulata*).

* Dickson, Trans. Bot. Soc. Ed. vol. viii. p. 229.

permission of Professor Oliver, of giving the characters of the genus in question.

SCAPHOPETALUM, n. g.

Calyx 5-sepalus, sepalis fere liberis vel cohærentibus, denique rumpentibus calycem bivalvem efformantibus. *Petala* 5, dorso convexa, apice cucullata, exappendiculata, 5-nervosa. *Urceoli staminei* lobi 5 anantheri, rotundati, revoluti, petalis alterni; *antheræ* in seriebus 3, loculis basi divaricatis. *Ovarium* sessile, 5-loculare, loculis 00-ovulatis. *Styli* connati. *Stigma* obsolete 5-lobum. Fructus * * *. *Arbores* v. *arbusculæ*. *Folia* petiolata, simplicia, oblonga, unicostata, retinervia. *Stipulæ* nervoso-striatæ. *Pedunculi* e trunco vel ramis vetustioribus nascentes, elongati vel fasciculati. *Corolla* flava.

S. LONGE PEDUNCULATUM. Foliis breviter petiolatis, oblongo-lanceolatis, acuminatis, glabris; pedunculo elongato, pendulo (v. supra terram repente?), filiformi, versus apicem in pedicellos breves cymosos diviso; sepalis lanceolatis, distinctis vel ima basi vix connatis; petalis obtusis, calceolatis, obscure striatis; urceolo stamineo 5-angulato, campanulato, antherarum loculis basi divergentibus.

Loc. "Mount John, Kongui River," *Mann. in herb. Hook.* n. 1836!

Frutex 3-pedalis. *Ramuli* tortuosi. *Petioli* 3–4 lin. longi. *Stipulæ* subulatæ, obscure striatæ, petiolos æquantes. *Folia* oblongo-lanceolata, integra, acuminata, glabra, unicostata, reticulata, 4–6 unc. longa, 1–3 unc. lata. *Pedunculus* flagelliformis, pendulus (v. repens?), 18 poll. longus, apice cymam multifloram gerens. *Pedicelli* pollicares et ultra. *Bracteolæ* minutæ, subulatæ. *Alabastra* ovato-acuta. *Sepala* ovato-acuta, extus tomentosa, intus prope basin carinata, longitudine vix pollicaria. *Petala*, sepalis dimidio breviora, obtusa, cucullata, leviter nervoso-striata. *Urceolus stamineus* membranaceus, campanulatus, 5-angulatus, superne decemfidus, lobis quinque anantheris rotundatis, demum reflexis, sepalis oppositis, totidem fertilibus petalis oppositi antheras tres, intra petali cucullum reconditas, gerentibus. *Antherarum* loculi, ob connectivum latum, basi divergentes. *Ovarium* oblongum, 5-lobum, 5-loculare. *Ovula* ∞, amphitropa, placentæ axili biseriatim affixa. *Stylus* intra tubum stamineum inclusus. *Stigma* terminale, obscure 5-lobum.

A plant remarkable for its long, pendulous, or creeping, whip-like inflorescence, recalling, as was pointed out to me by Professor Oliver, that of some species of *Gomphia*. From the sides of the peduncle proceed here and there minute branching thread-like bodies, like adventitious roots, but which may possibly be abortive pedicels. The petals are not so strongly striate as in the two following species; and the calyx consists of five distinct

(or nearly so) sepals, longer than the petals. Whether these are points of greater than specific value cannot be determined till better materials are accessible; but in the meantime I consider the agreement in all other points to be so great that it is better to place them all in one genus.

S. Blackii. Foliis breviter petiolatis, oblongis, acuminatis; floribus fasciculatis, pedicellis brevibus, calyce clauso, subcoriaceo, demum bivalvi, valvis cymbiformibus; petalis cucullatis, obtusis, nervoso-striatis, plicatis sulcatisque; tubo stamineo 5-angulari, infundibuliformi.

Loc. "Mount John, Kongui River," *Mann*. n. 1838, *in herb. Hook*!

Frutex 4–5-pedalis. *Ramuli* virgati, puberuli. *Petioli* 3–4 lin. longi. *Stipulæ* subulato-lanceolatæ, nervoso-striatæ, petiolos æquantes. *Folia* 5–8 poll. longa, 2–4 poll. lata, oblonga, integra, acuminata, glabra, subcoriacea, venatione reticulata. *Pedicelli* breves (4–5 lin.), fasciculati, erecti, e ramis nascentes. *Bracteolæ* minutæ, subulatæ. *Alabastra* subglobosa. *Calyx* subcoriaceus, purpureus, clausus, demum irregulariter rumpens, bivalvis, valvis cymbiformibus, patentibus, intus pilis parvis appressis munitus. *Petala* calceiformia, obtusa, cucullata, 5-striata, plicata, sulcata, glabra, sepalis paullo breviora. *Tubus stamineus* petaloideus, infundibuliformis, 5-angularis, apice 10-lobatus; lobis sterilibus 5, reflexis; lobis fertilibus totidem, antheras biloculares tres, in petalorum cucullis reconditas, gerentibus. *Ovarium* oblongum, 5-lobum, 5-loculare, tubo stamineo dimidio brevius. *Stylus* inclusus, stigma obscure 5-lobum. *Ovula* in quovis loculo 00, amphitropa, placentæ axili biseriatim affixa. *Fructus* ——.

This plant differs from the preceding in its inflorescence, and especially in the calyx. I have dedicated it to the late Mr. A. Black, who indicated as new the genus to which it belongs.

S. Mannii. Foliis breviter petiolatis, subcordatis, basi dilatatis, supra basin parum angustatis, oblongo-lanceolatis, acuminatis; stipulis lanceolatis, nervoso-striatis; floribus fasciculatis, calyce gamosepalo, demum bivalvi, valvis cymbiformibus, patentibus; petalis oblongis, obtusis, cucullatis, nervoso-striatis, plicatis, sepala superantibus; tubo stamineo membranaceo, infundibuliformi, 5-angulari.

Loc. "Mount John, Kongui River," *Mann. in herb. Hook.* n. 1837!

Frutex 3–4-pedalis. *Ramuli* tortuosi, rugosi. *Petioli* 3–4 lin. longi. *Stipulæ* persistentes, lanceolatæ, nervoso-striatæ, petiolos subæquantes. *Folia* subcordata, supra basin angustata, oblongo-lanceolata, acuminata, venatione reticulata, glabra, subcoriacea, 8–9 poll. long., 1–1½ lat. *Pedicelli* 1-flori, fasciculati, unciales, basi bracteolatæ, e ramis lateraliter nascentes. *Alabastra* ovato-oblonga. *Calyx* purpureus, coriaceus, 5-sepalus (sepalis connatis), demum bivalvis, valvis cymbiformibus horizontaliter patentibus, 5–6 lin. long. *Petala* flava, oblonga, obtusa, apice cucullata, nervoso-striata, calycem superantia. *Tubus stamineus*

membranaceus, infundibuliformis, 5-angulatus, 10-costatus, margine superne 10-fidus; lobis anantheris 5, cum petalis alternantibus, reflexis; lobis fertilibus antheras 3, biloculares (loculis divaricatis), in cucullis petalorum reconditas gerentibus. *Ovarium* oblongum, villosum, subquinquelobatum, 5-loculare. *Ovula* 00, amphitropa, placentæ axili biseriatim affixa. *Stylus* inclusus. *Stigma* minutum, obscure 5-lobum.

The peculiar form of the leaves, and the larger flowers, serve to distinguish this from the preceding.

I am indebted to Mr. Fitch for the drawings that accompany this communication.

EXPLANATION OF THE PLATES.

Plate II.

Scaphopetalum longe pedunculatum.

1, leaf; 2, inflorescence; 3, flower, showing calyx and corolla; 4, corolla opened to show the staminal tube. In older flowers the margin of the tube is reflected; 5, outer surface of petal; 6, ovary; 7, transverse section of ovary.

Plate III.

Scaphopetalum Mannii.

1, leaf; 2, inflorescence; 3, calyx opened; 4, corolla and staminal tube; 5, portion of staminal tube; 6, ovary; 7, cross section of ovary.

Scaphopetalum Blackii.

8, leaf with inflorescence; 9, flower; 10, back of a petal; 11, front of a petal; 12, portion of the staminal tube; 13, ovary; 14, cross section of ovary.

The drawings have been taken from flower-buds, and not from fully developed flowers, in which the staminal tube is larger in proportion than is shown in the figures.

Additions to the Lichens of New Zealand. By Rev. W. A. Leighton, B.A., F.L.S.

(Plate IV.)

[Read February 21, 1867.]

By the courtesy of Dr. Hooker, the learned Director at Kew, I have lately enjoyed the opportunity of examining a portion of the unarranged lichens in the Hookerian herbarium, and have detected the following amongst the collections made in New Zealand by William Colenso, Esq., F.L.S., in the year 1865–1866, which are undescribed and new.

1. **Bæomyces hæmotropus**, Leight., n. sp. Thallus crustaceus, tenuis, pallide fulvo-ochroleucus, glaber, verrucoso-rugosus, excavato-reticulatus; stipes brevissimus; apothecium capituliforme, rotundatum, depressum, immarginatum, carneo-subfuscum; sporæ? sphæricæ, incolores, indistincte visæ.

Incrustans terram atque gramina calcata. Northern Island (*Colenso in herb. Hooker.*).

The thallus of this interesting lichen is of a pale tawny-nankeen-colour, and closely incrusts the earth and grass over which it grows. The excavato-reticulate appearance is produced by the cicatrices from which the stipites of fructification have fallen, thus leaving minute, shallow, rounded depressions. The plant was in a young state, as I could not clearly distinguish the lamina proligera; nor am I certain that what I have described as spores are really such. When the hydrate of potash is applied, the entire lichen (thallus and fructification) becomes of a light yellow hue, which immediately changes to a permanent deep sanguineous red. In all other species of *Bæomyces* which I have examined, the thallus exhibited a permanent yellow reaction, and the fructification an orange-scarlet or brown reaction.

Plate IV. fig. 1. *Bæomyces hæmotropus*, nat. size; fig. 2. vertical section of fructification, magnified.

2. **Lecidea decedens**, Nyl., n. sp. Thallus crustaceus, ochroleucus, tenuissimus, minute rimosus; areolæ parvæ depressæ glabræ; apothecia multo majora areolis, prominentia, sessilia; discus planus, pruinosus, margine nigro, elevato, tenui, acuto cinctus; sporæ 8, elongato-oblongæ, fuscæ, biloculares; hypothecium crassum, nigro-brunneum, opacum; paraphyses validæ, distinctæ, apicibus incrassatis.

Ad saxa, New Zealand; littoral rocks, south side of Wellington Harbour (*Colenso*, no. 6543, *in herb. Hooker.*).

The nuclei of the spores approached more or less near to each other, thus giving an appearance of a wider or narrower septum.

Plate IV. fig. 3, *Lecidea decedens*, slightly enlarged; fig. 4, vertical section of apothecium, magn.; fig. 5, ascus and paraphyses, magn.; fig. 6, spores, magn. 600.

3. **Lecidea æruginosa**, Nyl. Chil. Thallus crustaceus, tenuis, ochroleuco-flavidus, rimulosus; areolæ depresso-convexiusculæ, glabræ; apothecia multo majora areolis, prominentia, sessilia, discus nigro-brunneus, convexiusculus, margine corneo, crassiusculo, pallido, integro, sæpe undulato cinctus; hypothecium pallidum; sporæ 8, oblongæ, simplices, incolores.

Ad saxa, New Zealand; same station as the preceding (*Colenso in herb. Hooker.* 6541–6544).

Nyl. Addit. Chil. 164, says, "hypothecium lateribus denigratum, apotheciaque æruginosè pruinosa." These appearances I have not observed in the specimens before me, in which the hypothecium was pale and, with the lamina proligera, imbedded in a pale brownish horny receptacle, whose upper edge constituted the margin of the apothecium. The paraphyses were slender and distinct, but closely packed. The aqueous solution of iodine turned the whole lamina proligera of a dark blue; but on separating the asci and spores, they were found to be turned to a dark-brown colour.

PLATE IV. fig 13, section of apothecium, enlarged; fig. 14, spores, magn. 600.

4. LECIDEA PARASITICA, Flk. Parasitic on *Lecanora parella*. New Zealand (*Colenso in herb. Hooker.*).

5. LECANORA LEUCOPHÆA, Flk.

Ad saxa, New Zealand; dry beaches near Napier (*Colenso*, no. 6445, *in herb. Hooker.*).

6. LECANORA PACHYPHOLIS, Nyl., n. sp. Thallus crustaceus, crassissimus, cinereo-glaucescens, profunde rimosus; areolæ magnæ, turgidæ, depresso-convexæ, glabræ, minute verrucoso-crenulato-corrugatæ, distinctissime et abundanter punctatæ spermogoniis nigris; apothecia magna, prominentiâ, areolis insidentia; discus purpureo-niger, planus, margine crasso turgido incurvato deformi cinctus; lamina proligera purpurea, minime profunda; paraphyses nullæ; asci ampli, elongato-clavati; sporæ? sphæricæ, purpureæ, indistincte visæ.

Ad saxa, Napier, New Zealand (*Colenso*, no. 6350, *in herb. Hooker.*).

A vertical section of the apothecium shows the lamina proligera, of a purplish hue, very shallow, resting on a thick deep hypothecium, pale above, and of a brownish hue at the base, imbedded in the thick turgid margin of the apothecium. The lamina proligera consists of short elongato-clavate asci vertically packed, without any paraphyses, which exhibit on the disk an irregular hexagonal form, sometimes apparently open and empty, at other times closed, and bearing in the centre a spherical globule, possibly the spores. The supposed spores were not detected *in situ* in the ascus. Spermatia elongated, cylindrical, straight. Hydrate of potash turned the thallus yellow. Dr. Nylander (*in litt.*) says, "Près du *L. atra*."

PLATE IV. Fig. 6*, *Lecanora pachypholis*, nat. size; fig. 7, areola of thallus, magn.; fig. 8, apothecia, magn.; fig. 9, vertical section of apothecium and thallus, magn.; fig. 10, asci, magn.; fig. 11, supposed spores, magn. 600; fig. 12, spermatia, magn. 600.

7. Lecanora pyrreniospora, Nyl. Scand. 151, tab. 1. fig. 6; var. *paupercula*, Nyl.!, ibid. Thallus evanescens; apothecia parva adpressa, fusca vel fusco-nigra, margine thallino tenui pallido inconspicuo cincta; sporæ 8, fuscæ, magnæ, elongato-oblongæ, 1-septatæ, quadriloculares, loculis fere sphæroideis; paraphyses distinctæ.

Ad lignum vetustum, New Zealand (*Colenso*, no. 6369, *in herb. Hooker.*).

The pale lamina proligera rests in a pale thalline receptacle filled with gonidia. Solution of iodine turns the gelatina hymenea and the entire lamina proligera of a deep blue, but does not affect the spores. The apothecia resemble old dark sublecideine ones of *Lecanora varia*; and the spores, both in size and in their cells, have an approximate resemblance to the spores of *Verrucaria nitida*, Schrad. The septum was rather indistinct. The New-Zealand plant is identical with the var. *paupercula*, Nyl.! Lich. Scand. p. 152, of which I possess, and have examined, a specimen received from Dr. Nylander himself.

Plate IV. Fig. 15, section of apothecium, magn.; fig. 16, spores, magn. 600.

On a new Species of *Umbilicaria*.

By Rev. W. A. Leighton, B.A., F.L.S.

(Plate IV.)

[Read May 2, 1867.]

Amongst a large mass of unarranged lichens belonging to the Hookerian herbarium at Kew, collected by Dr. W. J. Burchell in various parts of the globe, and which, by the courtesy of Dr. Hooker, I have been permitted to examine, I have detected a very remarkable and hitherto undescribed species of *Umbilicaria*, of a very peculiar citrine or flavo-virescent colour, and with spores unusual in this genus. Some few of the specimens were still attached umbilicately to a compact reddish-coloured granitic (?) rock. Unfortunately, very few of Dr. Burchell's specimens had the localities in which they had been collected indicated on their labels or envelopes; and it has therefore become difficult, if not impossible, to assign them accurately to their proper countries. In place of this they had letters, numbers, and dates attached, which evidently referred to some MS. list or journal kept by Dr.

Burchell in the course of his travels. The paper containing the specimens of the present lichen had written upon on it "P—22. 3, 14.—5098–9.—Lichen liturans—pulchre citrinum, grows only on the perpendicular side of vertical strata, which it paints with large streams of yellow, as if washed down from the top by rain." The figures "5098–9," no doubt represent the number in the entire collection. By reference to Dr. Burchell's MS. Journal at Kew this very interesting lichen is entered as collected March 22, 1814, by Dr. Burchell himself at the Cape of Good Hope, which he left in 1815.

UMBILICARIA FLAVO-VIRESCENS, Leight., n. sp. Thallus monophyllus, interdum subcomplicatus, umbilicato-adfixus, coriaceo-firmus, crassiusculus, citrinus vel flavo-virescens, opacus, lævis, laciniatus, rotundo-lobatus, undulatus, subtus fusco-niger, scabridus; apothecia arcte insidentia, prominula, aggregata, potissime subperipherica; discus plano-convexus, niger, flavo-pruinosus, margine thallino flavo-virescente cinctus; sporæ 8, rotundato-oblongæ, medio constrictiusculæ, uniseptatæ, fuscæ; paraphyses discretæ; gelatina hymenea iodo cærulescente; spermogonia arthrosterigmatibus munita, spermatia gracilia cylindracea.

Ad saxa granitica, Cape of Good Hope (*Dr. Burchell in herb. Hook.*).

So far as I know, there is only one other species of *Umbilicaria* which approaches this in its fuscous 1-septate spores, *U. haplocarpa*, Nyl. (Lich. Exot. 217), a native of Peru, but which is abundantly distinct by its cinerascent thallus, the hirsuties of the under surface, and the number (6) of the spores. To be certain, I forwarded a frustule to Dr. Nylander; and he replies (in litt. March 19, 1867) "Aucun *Umbilicaria* ne m'a offert rien d'approchant de ce que vous nommez *U. flavo-virescens*, Leight." In a subsequent letter Dr. Nylander expressed his belief that this *Umbilicaria* was identical with *Endocarpon Thunbergi*, Ach.

The spermogonia are plentifully scattered over the surface of the thallus as minute black dots; and the contents are those peculiar to the genus. A section of the thallus shows a loose yellow epidermis, then a pale brown stratum of minute cells, below which is a broad stratum of larger cells, plentifully interspersed with small-sized gonidia; then a large mass of interwoven filaments, with larger gonidia scattered here and there in clusters of two, three, four, or more; below this is a narrow band of brownish minute cells, covered externally with the verrucæ of the under surface. The apothecia burst through the epidermis, which they in a manner upheave; and in the young state their

flat depressed disks appear surrounded with it in an irregular crenulate manner. The verrucæ of the under surface are oblong in form, particularly towards the margins of the thallus, and are more or less apically flattened, frequently expanding towards the umbilicus into irregular flattened areolæ, with more or less of a furfuraceous appearance.

PLATE IV. Fig. 17, *U. flavo-virescens*, nat. size, in profile; fig. 18, under surface of thallus, nat. size, showing umbilicus; fig. 19, thallus seen from above, nat. size; fig. 20, portion of the under surface, magn.; fig. 21, verrucæ of under surface, magn.; fig. 22, apothecia, magn.; fig. 23, vertical section of thallus and apothecia; fig. 24, enlarged section of thallus; fig. 25, ascus, spores, and paraphyses; fig. 26, spores, magn. 600; fig. 27, arthrosterigmata and spermatia attached, magn.; fig. 28, spermatia detached, magn.

Notes on Introduced Plants occurring in the Neighbourhood of Sydney. By W. WOOLLS, F.L.S. In a letter to the President.

[Read December 20, 1866.]

MY DEAR SIR,—Thinking that it may not be uninteresting to you to have a list of the plants introduced accidentally into this neighbourhood, I feel a pleasure in forwarding one. If I had enjoyed the opportunity of visiting other parts of this vast continent, I dare say that I should be able to furnish a much larger list; but occupied as I am in duties which keep me very much at home, my observations have not extended beyond fifty or sixty miles from Parramatta.

THALAMIFLORÆ.

(Papaveraceæ).

Argemone Mexicana.

(Cruciferæ).

Capsella bursa-pastoris.
Senebiera didyma.
Sisymbrium officinale.
Sinapis arvensis.
Raphanus sativus.

(Malvaceæ).

Malva sylvestris.
M. rotundifolia.
M. crispa.
Sida retusa or *rhombifolia* *.
Cristaria coccinea.

(Caryophylleæ).

Polycarpon tetraphyllum.
Stellaria media.
Cerastium vulgatum.
Silene Gallica.
Spergula arvensis.
Dianthus prolifer.
Agrostemma githago.

(Fumariaceæ).

Fumaria officinalis.

(Geraniaceæ).

Pelargonium graveolens.
Erodium moschatum.

(Lineæ).

Linum Gallicum.

(Portulaceæ).

Portulaca oleracea.

(Phytolaccaceæ).

Phytolacca octandra.

CALYCIFLORÆ.

(Compositæ †).

Erigeron canadense.
E. linifolium.
Gnaphalium luteo-album.
G. Indicum?
Carduus Marianus.
Onopordum acanthium.

* Probably indigenous.

† With respect to some of the *Composites* which have sprung up in this district, I am not able to decide whether they are really importations from abroad, or simply from other parts of the continent.

Tanacetum vulgare.
Pyrethrum parthenium.
Anthemis cotula.
A. nobilis.
Bidens tripartita?
Tagetes minuta.
Cichorium intybus.
Sonchus oleraceus.
Taraxacum dens-leonis.
Hypochæris radicata.
H. hispida.
Crepis tectorum.
Galinsogea parviflora?
Siegesbeckia orientalis?
Centaurea solstitialis.
Senecio vulgaris.
Chrysanthemum segetum.
Tragopogon porrifolius.
Xanthium spinosum.

(Leguminosæ).

Vicia sativa.
Melilotus parviflora.
Goodia polysperma.
Trifolium repens.
Ulex Europæus.
Lespedeza (indigenous).
Medicago nigra.
M. lupulina.
M. maculata.

(Euphorbiaceæ).

Ricinus communis *.
Euphorbia peplus.
E. chamæsyce (indigenous).
E. helioscopia.

(Onagreæ).

Epilobium roseum.
Œnothera biennis.
Œ. rosea?

* The Castor-Oil, in favourable localities, especially to the north, becomes a tree of 20 or 30 feet high.

(Rosaceæ).

Rosa rubiginosa.

(Umbelliferæ).

Sium latifolium (rare).
Fœniculum vulgare.
Caldasia or *Oreomyrrhis* (rare, native).

COROLLIFLORÆ.

(Asclepiadeæ).

Gomphocarpus fruticosus.

(Convolvulaceæ).

Cuscuta epithymum *.

(Lamiaceæ).

Stachys arvensis.
Marrubium vulgare.

(Plantagineæ).

Plantago lanceolata.
P. major.

(Primulaceæ).

Anagallis arvensis.
A. cærulea.

(Scrophularinæ).

Antirrhinum orontium.
Linaria spuria.

(Solaneæ).

Physalis pubescens.
Nicandra physaloides.
Datura stramonium.
Solanum nigrum.

(Verbenaceæ).

Verbena Bonariensis.

(Monochlamydeæ).

Chenopodium murale.
C. ambrosiodes.
Rumex crispus.
R. sanguineus.

* Probably the Australian plant.

R. acetosella.
Urtica urens.
U. dioica.
Sisyrinchium micranthum.
S. anceps.
Cyperus hydra.
Poa annua.
Hordeum marinum.
? *Lolium temulentum.*
Holcus lanatus.
? *Panicum ciliatum.*
? *Cynodon dactylon* (indigenous).
? *Lappago racemosa* (indigenous).

In the preceding list, I have confined myself to the enumeration of those plants which have established themselves in cultivated ground. Some few of them, however, find their way into the woods; but the greater majority prefer gardens and fields. I have seen *Capsella bursa-pastoris* and *Sisymbrium officinale* growing in the back streets of Parramatta; but the rest of the introduced Cruciferæ sprung up amongst the wheat, barley, and oats. *Cristaria coccinea* is becoming a troublesome weed to the settlers, and *Sida rhombifolia* is increasing rapidly; but the latter is likely to prove useful for its strong fibre. *Polycarpon tetraphyllum* and *Stellaria media* are plentiful in gardens; and, although supposed to be indigenous, the latter differs very much in habit from the same species when growing in shady creeks &c. *Erodium moschatum* has certainly come here accidentally; but probably the strong-scented *Pelargonium* has escaped from a garden. It has a wonderful tendency, however, to adapt itself to sandy soil near the coast, and has spread very widely through the colony. *Portulaca oleracea* is indigenous in some parts of Australia; but as it never appears here excepting in cultivated places, I am inclined to regard our variety as an importation. This weed is sometimes used as a vegetable for eating, and cows are very fond of it. *Phytolacca octandra* is abundant in the neighbourhood of Sydney, and seems likely to follow the railway into the interior. It is sometimes employed for medicinal purposes; and if any method can be devised for fixing the colour, the juice of the berries will become a valuable dye. The introduced Composites are comparatively numerous, and some of them are exceedingly troublesome weeds, especially *Erigeron canadense*, *E. linifolius*, *Cen-*

taurea solstitialis, and *Xanthium spinosum*. The last-mentioned is the Bathurst Bur, which does so much injury to the wool in some districts. *Carduus Marianus* is regarded as a great pest in some places, but it has been found useful for fodder where grass is scarce, especially when it is cut down and suffered to become partially dry. After the last floods, *Tagetes* and *Tragopogon* appeared abundantly on the Nepean; and *Cichorium*, which was originally cultivated, has sprung up spontaneously in the same locality. *Chrysanthemum segetum* is rare. *Goodia polysperma* has firmly established itself in this neighbourhood; and, until I read your remark respecting it, I was under the impression that it was indigenous. *Melilotus parviflora* has become a great nuisance to the agriculturist, as it grows with the wheat, and imparts a peculiar flavour to the flour. It is known by the name of Scented Trefoil; and some millers have so much objection to any wheat affected by it, that they refuse to purchase grain from those districts where it is known to prevail. Some species of *Medicago* have a troublesome bur (though not so injurious as that of *Xanthium*); and the cultivated *M. sativa* has lately been much infested with *Cuscuta epithymum*. This has prevailed to such an extent in some parts of the colony that the crops have been most seriously affected by it. We have some species of *Cuscuta* which are indigenous; but the parasite in question has been introduced with seeds from Europe, and seems likely to occasion trouble and loss to the farmers. *Epilobium roseum* has come to Australia amongst grass-seeds, but *Œnothera* has probably found its way from gardens. *Rosa rubiginosa* springs up so rapidly in fields that it materially retards the growth of the grass; and it becomes necessary to destroy it whereever practicable. The Umbelliferæ springing up spontaneously are very limited. *Sium* and *Caldasia* appear occasionally; but *Fœniculum vulgare* is the only one that returns regularly. *Gomphocarpus*, or, as it is commonly called, "Wild Cotton," has spread very widely throughout the colony, and is regarded as a nuisance by the settlers. The milky juice of it is reported to be highly injurious, and the plants themselves are frequently covered with Aphides. *Stachys arvensis* is useful in the winter season as food for cows. Many cart-loads of it have been cut down for that purpose in the orange-orchards near Parramatta; but I am informed that, when the plants are old, they impart an unpleasant flavour to the milk. The uses of *Marrubium* and *Plantago* are too well known to need any remarks; and the pretty

little *Anagallis* is as plentiful here as in Europe. *Physalis*, or "Cape Gooseberry," has long been known in Australia; and as the fruit is available for jam, it is not to be regretted that it is so well adapted to our climate. *Nicandra physaloides* appears in many gardens; and I am sorry to add that *Datura stramonium*, though useful in asthmatical complaints, has occasioned the death of several children who, from time to time, have swallowed the seeds. *Solanum nigrum* seems to have two varieties here. The one is indigenous; the other is identical with the European plant, and has probably come here with English seeds. It is remarkable that the children eat the berries of *S. nigrum* with impunity. *Rumex acetosella* is a troublesome weed in orchards, but not so injurious as *Cyperus hydra*, which is occasioning much inconvenience to gardeners in Sidney. The late Mr. W. S. Macleay, F.L.S., assured me that he had tried every expedient to remove the weed, but without success. I fear that, unless some means of eradicating it can be devised, many gardens will be ruined; for it seems to outgrow everything else. At first it did not extend beyond the neighbourhood of Sidney, but within the last ten years it has established itself in Parramatta and some of the inland towns. A pretty little *Sisyrinchium* (*S. micranthum*) is very plentiful in our fields here in the spring. This has sometimes been mistaken for Brown's *Renealmia pulchella*, a plant which I have never yet seen. There is on the Mittagong range a small variety of *R. paniculata*, which perhaps may be allied to it. I am inclined to think, however, that the true *R. pulchella* is a New Zealand plant, and not indigenous here. With respect to the introduced grasses I feel some difficulty, because, in the early days of the colony, many European and Indian grasses were sown in this neighbourhood. It seems to me highly probable that *Hordeum marinum*, *Lolium temulentum* and *Holcus lanatus*, found their way here accidentally; but whether *Panicum ciliatum* and *Cynodon dactylon* are really indigenous or not I am not certain; for, although described by Brown, they appear only in cultivated land in this part of the colony.

The various ways in which plants become accidentally acclimatized afford much interest to the observer. In some instances the causes can be clearly traced, such as (1) the mixture of other seeds with grass, clover, and garden herbs, (2) the use of different weeds, either wholly or in part, in packing-cases, (3) the tenacity with which the seed-vessels of some plants adhere to the manes and tails of horses, (4) the presence of seeds

in some imported manures, and (5) the migrations of birds from one country to another, and the influence of periodical winds and tides. All these causes are in daily operation, and are topics worthy of consideration; but perhaps it may be equally profitable to notice the extraordinary facility with which some plants adapt themselves at once to the soil and climate, whilst others spring up, languish for a time, and die out. This peculiarity gives an indication of the kind and character of many plants which might be profitably introduced into the colony. It may be regarded, indeed, as a hint furnished by nature for the benefit of the inhabitants.

With much respect, I remain, &c. &c. &c.

WILLIAM WOOLLS.

Parramatta, September 20, 1866.

Description of Three New Genera from West Tropical Africa, belonging to the Natural Orders *Guttiferæ*, *Olacineæ* and *Celastraceæ*. By Professor OLIVER, Keeper of the Kew Herbarium.

[Read December 20, 1866.]

ALLANBLACKIA *, genus novum Guttiferarum.

Flores dioici: *Sepala* 5, orbicularia, late imbricata, interiora majora, coriacea, margine scariosa. *Petala* 5, late obovato-cuneata, sepalis longiora, alabastro imbricata et in globum conniventia. *Flores* ♂: *Stamina* 5-adelpha, phalangibus petalis oppositis, crassis, cuneato-spathulatis, apice dilatatis, antheras sessiles sursum et introrsum gerentibus; antheræ liberæ, late ellipticæ v. rotundatæ, longitudinaliter dehiscentes. *Discus* centralis 5-lobus, lobis plus minus explanatis, phalangibus androecii alternantibus, intus transversim corrugatis. Flores ♀ : *Discus* (androecii rudimentum?) brevis, crassus, lobatus, ovarii basin cingens. *Ovarium* conicum, crassum, placentis 5 multiovulatis prominulis haud coalitis,

* Dedicated to the memory of my late friend Mr. Allan Black, Associate of the Linnean Society, for several years Curator of the Kew Herbarium. Through his hands nearly all the collections received at Kew from West Tropical Africa passed; and to his very extensive knowledge of plants and untiring industry we greatly owe the present accessible state of these collections, as well as preliminary analyses and notes upon many of the more remarkable species.

uniloculare. *Stigma* sessile, peltatum, crassum, integrum. *Ovula* cuique placentæ biseriatim affixa, sessilia, adscendentia, amphitropa, micropyle infera. *Fructum* maturum non vidi. —*Arbor* 40-pedalis, glabra, ramis teretibus. *Folia* opposita, coriacea, penninervia, oblongo-elliptica v. obovato-oblonga, breviter acuminata v. apiculata. *Inflorescentia* umbellatim racemosa, sæpius terminalis. *Flores* ampliusculi, pedunculati, in axillis approximatis foliorum sæpius ternati v. geminati.

A. FLORIBUNDA, species unica. *Folia* 4–6 poll. longa, 1½–2½ poll. lata; pet. ¼–½ poll. longus. *Flores* diametro circiter 1½ poll. *Stigma* fere ½ poll. latum.
Camaroons River, *G. Mann*!

This very remarkable plant does not well fall into any of the tribes of Guttiferæ as at present circumscribed. From its multiovulate placentæ and general facies, I incline to refer it to *Clusieæ*.

ALSODEIOPSIS, genus novum Olacinearum (§ *Icacineæ*).

Flores hermaphroditi, parvi. *Calyx* quinquepartitus, segmentis lanceolatis v. lanceolato-subulatis, acutis. *Petala* quinque, infra medium vel basi coalita, lanceolata, apice recurva, æstivatione valvata (sepalis 3–4-plo longiora). *Stamina* quinque, libera, cum petalis alterna; filamenta subulata, glabra; antheræ filamento longiores v. æquilongæ, glabræ, ovato-lanceolatæ v. ellipticæ, apice connectivo brevissime apiculatæ, longitudinaliter dehiscentes. *Ovarium* liberum, pilosum, uniloculare, in stylum attenuatum. *Stylus* gracilis vel sursum leviter incrassatus. *Stigma* terminale, minutum, obtusum. *Ovula* geminata, ab apice cavitatis pendula. *Drupa* exsucca, oblonga, teres, monosperma, pericarpio tenuiter coriaceo, glabra. *Semen* pericarpii cavitati conforme, testa tenuissima membranacea arcte adhærente, cotyledonibus fere omnino concretis basi lobo obliquo supra radiculam parvam ovoideam superam connivente.—*Frutex* ramulis teretibus, novellis strigilloso-hirsutis. *Folia* alterna, integra v. obscure undulata, membranacea vel tenuiter coriacea. *Flores* parvi, pedicellati, in cymulis brevibus racemosis axillaribus dispositi.

A. MANNII, species unica. *Folia* oblanceolato-oblonga, acuminata, basi obtusa nonnunquam obliqua, integra, pagina superiore glabrata, inferiore in nervo medio venulisque secundariis prominulis hispidula

vel glabrescentia, 3–9 poll. longa, 1½–2¾ poll. lata, petiolo strigilloso, 1–2 lin. longo. *Inflorescentia* strigilloso-hirta, ½–1½ poll. longa. *Flores* circiter 1½ lin. longi. *Fructus* (exsicc.) poll. longus, ½-poll. latus.

Mount John, River Kongui (no. 1805), *G. Mann*!

There are specimens of two forms of this plant in the Kew Herbarium (those with smaller leaves, without locality indicated); I cannot distinguish them specifically. Their general facies is so much that of some species of *Alsodeia* that Mr. Black had provisionally referred them to that genus. The structure of the seed appears to me very similar to that of *Sarcostigma*, in which, moreover, the cotyledons are connate for the greater part of their length.

Campylostemon, Welwitsch MS., genus novum *Celastracearum*.

Flores hermaphroditi. *Calyx* 5-partitus, lobis ovato-rotundatis leviter imbricatis. *Petala* 5, sessilia, sepalis multo longiora, patentia, oblongo-elliptica, æstivatione imbricata. *Stamina* 5, in disco annulato minuto ovarii basin cingente inserta, incurva, filamentis lineari-subulatis, antheris parvis introrsis, quadrilocellatis, transversim dehiscentibus. *Ovarium* liberum, basi latiusculum, glabrum, triloculare; stigma trifidum, lobis sessilibus minutis ovoideis; ovula circiter 8 in utroque loculo, biseriata. *Fructum* non vidi.—*Frutex* (*fide* sched. Welwitsch.) alte scandens, glaber. *Folia* opposita, petiolata, membranacea, oblongo-elliptica vel ovalia, acuminata, remotiuscule serrulata. *Flores* sulphurei, in cymis axillaribus multifloris pedunculatis folio multo brevioribus dispositi.

C. Angolense. *Folia* 2–3½ poll. longa, ¾–1½ poll. lata, interdum ovato-lanceolata; petiolus gracilis, ¼ poll. longus. *Flores* diametro circiter 2½ lin.

Prov. Cazengo, Angola, *Dr. Welwitsch*!

Campylostemon serves to strengthen the already intimate connexion between Celastreæ and Hippocrateæ. Its pentandrous flowers and introrse anthers ally it to the former, while the structure and mode of dehiscence of the anthers, together with the numerous ovules and scandent habit, favour an affinity with the latter.

On Nutmeg- and other Cultivation in Singapore.

By Dr. C. Collingwood, F.L.S.

[Read February 7, 1867.]

The cultivation of the soil in Singapore Island has been carried on with great industry and enterprise, and for a while with success; but, unfortunately, after hundreds of thousands of dollars have been spent upon it, the planters have learned, too late, that neither the soil nor the climate of Singapore are favourable to the growth of those productions, such as nutmegs, cloves, cotton, sugar, coffee, &c., upon which such vast sums have been expended and ultimately swallowed up, bringing their proprietors in many instances to ruin.

The climate of Singapore is very peculiar, and is marked by an absence of seasonal change, which has an evil influence upon man as well as upon plants. There is no regular recurrence of summer and winter, no distinctly dry season and wet season, but a remarkable equality all the year round; added to which, the rains, instead of coming at definite periods, are capricious in their fall, and therefore defeat the prognostications of the planters. The temperature does not vary more than 20° or 22° during the whole year, ranging between 70° and 92° as a rule, and therefore is not in excess during the hottest seasons. Rain falls upon half the days of the year, neither so frequently nor so heavily now as it did before the jungle was cleared away from the neighbourhood of the town; but the whole amount of rain is moderate.

The soil is poor, and will grow nothing without care and plenty of manure. It consists of a fine, compact, reddish clay, in the interior of the island not having much substance, and mixed with sand, which increases in quantity near the sea-beach, the clay predominating inland, and the sand near the coast. The island was, of course, originally covered with jungle; but there has been a great mania for clearing, and it has been done in an indiscriminate manner; so that no judicious spots of shelter have been left standing, which would have proved invaluable as protection for certain crops, as well as being useful in other ways. The virgin soil, covered with a thin layer of decaying vegetable matter, was rich enough; but when, after a little time, its material was exhausted, nothing but plenty of manure would induce the growth of remunerative crops.

Foremost among these crops was the *Nutmeg*—a plant which

once promised a harvest of prosperity to the settlement, but which, after for a few years producing every result that could be desired, was destined to end in utter disappointment, and, in too many cases, in utter ruin to the proprietors. The nutmeg-plantations of Penang preceded those of Singapore, and were for some years in the hands of the East-India Company, who, after expending considerable sums upon them for some years without receiving an adequate return, finally gave them up in disgust, and ordered them to be sold. Taken up by enterprising planters, the Penang spice-plantations for a time yielded ample returns, owing rather to the care which had been spent upon them by the previous possessors. Singapore became a British settlement in 1824; and in the infancy of this settlement it was not attempted to vie with Penang in cultivating these expensive plantations: but about 1837 an impetus was given to nutmeg-cultivation in Singapore, with results so promising that everything gave way to the mania for planting this species. Large clearances in the jungle were purchased from Government at considerable distances from town; and expensive bungalows were erected upon such estates, and surrounded by plantations of this valued tree; and nearer the settlement private gardens were turned into nutmeg-nurseries, and the houses were closely surrounded with nutmeg-groves.

The nutmeg-tree is, when in health, a handsome bushy tree, between 20 and 30 feet high, with numerous dark-green shining leaves. It is evergreen, and ever flowering, so that fruit and flower constantly coexist upon the tree—the flowers small, yellowish, and urceolate, and the fruit needing no description here. Being diclinous, a great inconvenience arises from the fact that a great many male trees are planted and cultivated, being undistinguishable from the female trees until the flowers appear. Such trees are of course useless, since they do not bear,—*one* male tree to about *twenty* females being sufficient for the purposes of impregnation and to ensure the swelling of the ovule.

The trees were not allowed to be left to the natural powers of the climate and soil, but were richly manured and forced into yielding heavy crops. To the manner of doing this, and to the extent to which they were forced into luxuriance, may probably be traced the catastrophe which eventually blotted out nutmeg-cultivation from the settlement. Around each tree, and just level with the outer branches, a trench was dug about one foot deep and one foot wide, and this was filled with a manure of cow-

dung. The result of this universal treatment was that the trees for a time grew luxuriantly, and yielded large returns. About six hundred nuts, or 8 lbs. weight, were yielded by a good tree during the year; and as the crop was yielded all the year round, independently of season, some plantations produced a picul (133 lbs.) per diem on an average—the value of the picul being 70 or 80 dollars—or from 25,000 to 30,000 dollars per annum.

For upwards of twenty years the planting was carried on vigorously. Plantations changed hands at very extravagant prices; and much money was made during that period. In the year 1860, however, a sudden destruction came upon the trees, from an unknown quarter. To the dismay of the planters, there appeared among the trees (which up to that time had yielded magnificently) a blight whose destructive effects could not be arrested, while the source of it defied all inquiry. In the night a tree would be attacked, and the morning light would show its topmost branches withered; the leaves fell off; the disease slowly spread downwards, chiefly on one side of the tree; and, in spite of every attempt to check it (the lower portion often being for a long time green and bushy), the tree became an unsightly mass of bare and whitened twigs. Most trees were entirely stripped in time, and became mere skeletons. Large outlay was expended in the endeavours to arrest the destruction, but it was all thrown away. No situation was exempt from its ravages; hills and valleys alike suffered; nor could any principle be traced in its promiscuous attacks. Upon a close examination of diseased parts, it is found that the formative layer inside the bark dries up and turns black; the leaves then wither and fall off; and soon the bark is found to be full of small perforations; but no insect of any kind has ever been discovered in connexion with the change, nor has any fungus been charged with the destruction. Its nature has been a mystery and a puzzle to the planters, who have, for the most part in vain, sought for a cause, either near or remote, and whose efforts to arrest it have proved entirely unavailing. I have heard various suggestions offered, some of them of the wildest character, to account for the disease. That which my friend M. José d'Almeida proposes is by far the most reasonable, and in fact commends itself to the judgment of the vegetable physiologist. It is that the trees had long been unnaturally forced, by digging trenches too closely around their spongioles, and by too rich and long-continued manuring, by which heavy crops, it is true, were for a time obtained, but which at last

exhausted the tree, so that the premature decay thus brought on by inflexible physiological laws was incapable of being arrested by any after-treatment.

When it was found that, in spite of care and lavish expenditure, the trees surely died, a reaction took place. The planters abandoned the plantations in disgust, in many cases while there were still numerous healthy trees; and the land reverted to the Government. In other cases, where expensive bungalows had been built upon the estate, they were sold for a small proportion of the sums expended in building them, since they were, as a rule, too far from town to command any competition, and ceased to be conveniently situated. Many planters, both English and Chinese, whose whole estates were invested in nutmeg-plantations, were thus reduced to ruin, and absolutely penniless; and distress and disappointment everywhere prevailed.

It is a curious fact that many of these abandoned trees, around which has now sprung up a thick jungle undergrowth, have, since they have been thus neglected and left to themselves, *recovered*, and relieve the generally dismal prospect of bare branches and skeleton trees. I have myself seen these dark-green healthy trees in many situations where they are quite uncared for, even amongst the oldest plantations in the island; and this fact seems decidedly corroborative of the idea that the disease was one of exhaustion and decay, arising from unnatural forcing. Another fact is significant, viz. that at Penang, where this cultivation, as described, was carried on with the greatest vigour and the greatest expenditure, the destruction has been most complete and marked, while at Malacca, where the people were not so rich, and could not afford to manure the trees so highly, they have not suffered so severely as at Penang and Singapore.

At the present moment there is no such thing as nutmeg-cultivation either at Penang or Singapore; nor does it seem probable that the experiment will be again tried. Planters are now persuaded that neither the soil nor climate are favourable for their production; and, as we shall presently see, other crops have fared but little better. The trees which still exist are neglected and abandoned by their owners, though they still yield nutmegs. These are gathered by any Chinese or Malays who take the trouble to do so; and the few nutmegs, insignificant in quantity, which now find their way into the Singapore market, are obtained in this way,—a clear gain to those who carry them there.

Cotton is another product the cultivation of which has been attempted in Singapore. The cotton-plant always thrives well in private gardens; and I have seen large pods of good quality on plants in such situations. The only large plantation which has given it a fair trial, however, was that of the late enterprising Mr. d'Almeida, who for two successive years expended considerable sums in the experiment. But cotton-cultivation failed for the same causes as those above referred to—the absence of regular seasonal changes, and the irregularity of the downfalls of rain, which cannot be predicted with any certainty, and therefore cannot be guarded against. The cotton grew magnificently; the pods were produced and burst open; and then a downpour of rain would ruin the fibre before it could be gathered. Another cause which led to its abandonment was the appearance of a small red beetle which proved very destructive to the pod.

The same gentleman tried *Coffee*-planting, and spent and lost many thousands of dollars by the unthankful experiment. It has also been attempted by others without success; and a company formed for that purpose failed. Here, again, the causes of failure are chiefly natural ones, of the same kind as those already alluded to. The coffee-plants require shelter; and the indiscriminate cutting down of the jungle had left the country entirely open, and no shade could be obtained. Then the irregularity of the seasons prevented the plants from attaining that perfection which otherwise they might have done, while the uncertain rains were a further source of injury to the crops. The flowers might be in promising profusion, when a heavy shower would suddenly fall upon them and destroy two-thirds at one blow. Another difficulty which interferes with this and other cultivation is the comparatively high price of labour. Anything which requires much manual labour in the preparation is sure to languish at Singapore from the difficulty of persuading the Malays to work for any consideration; and the Chinese are the only people who can be induced to perform laborious occupations.

This last cause has been mainly influential in preventing the cultivation of *Cinnamon*. This tree, with very little care, grows beautifully in Singapore, and would doubtless prove a source of wealth, were it not for the great expense of its manufacture. The various and tedious processes which the bark has to undergo in its removal and preparation cost more than the spice will fetch in the market. In other cinnamon-producing countries, as in Ceylon, these processes are performed chiefly by children,

who, of course, are paid at so low a rate as to render the preparation remunerative; but in Singapore the population is not large enough for this; and expensive adult labour only is procurable, and that with some difficulty.

Sugar, on the other hand, has failed from natural rather than economic causes. The chief obstacle to its cultivation is the poorness of the soil, which can only be remedied by adding plenty of manure; and when this source of additional expense is added to the high price of labour, considerable margin is subtracted from the profits. Still, with abundance of manure, the sugar-cane thrives extremely well; but now another natural cause steps in and neutralizes the result: this is the rain, the uncertainty of which, or rather the constancy of which, is a serious obstacle. The saccharometer, instead of registering 11° in the sweet juice, is sometimes reduced to $7\frac{1}{4}$° after rains, which appear to dilute the sap and deteriorate the produce. In a plantation ready for cutting, perhaps fifty acres may be got down one day and of good quality; and then a heavy rain comes before the rest can be cut, and this proves to be of considerably inferior quality.

The late Mr. d'Almeida was the first to call the attention of the public to the substance now so well known as *Gutta-percha*. At that time the *Isonandra Gutta* was an abundant tree in the forests of Singapore, and was first known to the Malays, who made use of the juice which they obtained by cutting down the trees, and which, when collected, they boiled and purified. Mr. d'Almeida, unacquainted with England and its institutions, and acting under the advice of a friend, forwarded some of this substance to *Somerset House*, as it was described to me—but, I believe, more correctly, to the *Society of Arts*. There it met with no attention, and was put away uncared for. A year or two afterwards Dr. Montgomery sent specimens to England; and bringing it under the notice of competent persons, its value was at once acknowledged, and it rapidly became an important commodity. In any case it was introduced from Singapore; and the sudden and great demand for it soon resulted in the disappearance of all the gutta-percha trees in Singapore Island. The forests of Johore, however, yield a vast supply—though these must fail in time, when it is borne in mind that to abstract the juice the tree is always cut down, the produce of a single tree averaging 11 or 12 lbs.

With regard to *Gamboge*, it has never been regularly cultivated

in Singapore. The late Mr. d'Almeida, already referred to, introduced some trees from Siam, but simply as a matter of curiosity, and for experimental purposes. These trees have not been protected in any way, but nevertheless they thrive well; and the soil evidently is well suited to them. The plantation in which they were placed has changed hands, and no care has been taken of the trees; but those I saw were green and flourishing, bearing abundance of flower and fruit, and yielding, upon the slightest incision, an abundance of yellow resinous juice. In their immediate neighbourhood are numerous healthy seedlings springing up uncared for; and I was assured that the seeds carried by birds have been taken to spots at a distance from the trees originally planted; and one of the largest and healthiest trees I saw was pointed out to me as one which had grown there spontaneously, and probably owed its origin to this cause. I have preserved a few specimens of this tree, and of the female flowers in spirits, which I shall forward when I have an opportunity of doing so. But, although to all appearance it would do well, the existing trees are quite neglected, no one having taken up the matter of cultivating them. For this reason also I was unable to procure any specimen of the Gamboge produced by them, though I was informed, by the Chinese gardener who showed me the trees, that incisions were made in this bark and small bamboos were applied to the incised spot to receive the juice. Hence the *Pipe-gamboge* of commerce. I may add that the soil on which this Gamboge appears to thrive so well is a reddish sandy soil, containing a little clay, but a larger proportion of sand.

This brief account of the past cultivation of Singapore would not be complete without some mention of two plants which have been largely cultivated by the natives, though the cultivation of them is now on the decline. These are Gambier (*Uncaria Gambir*) and Pepper. With regard to the first of these (*Gambier*), the mode of its preparation demands a very considerable supply of firewood; and therefore it has always been planted in clearances made in the jungles of the interior of the island, and distant from the town. Here the planters squatted, and have for a long while successfully cultivated this favourite masticatory. The Gambier plant is a creeping annual, and rises to the height of six or seven feet. In eight months the young plants are fit to be cut; and the young leaves and shoots are cropped and boiled; the extract thus obtained is evaporated to a paste, dried, and cut

into small blocks an inch square, and is then ready for the market. The workers in these plantations are exclusively Chinese; and the proprietors are also of that nation. The Gambier is a plant which very rapidly exhausts the soil; and the quantity of wood required for boiling the shoots demands the immediate neighbourhood of an inexhaustible supply. In course of time, therefore, the wood has all been cut down close to the plantation; and the fact of having to convey it a mile or so is fatal to the successful cultivation of the drug; consequently Gambier-planting is now fast disappearing in Singapore.

It had always been found profitable to combine with *Gambier*-planting the cultivation of *Pepper*; partly because this could be attended to in the intervals of Gambier-cropping, but chiefly because the boiled shoots and leaves of the Gambier, after the astringent was extracted, formed an excellent ready-made manure for the Pepper, free of expense, which no other manure would have paid. As therefore the planting of Gambier declines, that of Pepper must necessarily decline also; and as the two rose together, so they must also fall together. Considerable quantities of Pepper are still produced in Singapore, but not nearly so much as formerly; and many of the Gambier and Pepper clearances have reverted to the Government. In the peninsula of Johore, however, there are abundance of Pepper and Gambier plantations.

It may be asked, however, If Singapore has failed in realizing the expectations of planters in so many instances, and so many different crops have one by one proved ruinous to their proprietors, what *will* grow remuneratively in the island? or will anything do so? The answer to this has been solved of late years. In the first place it is found that all fruit-trees flourish in the soil of Singapore; and Breadfruit, Jack, Dookoo, Mangosteen, Pineapple, Plantain, Rambootan, Custard Apple, Mango, Guava, and Durian, with many others, now occupy the plantations in which Nutmegs were formerly grown. The last-named fruit, so great a favourite with some, and so detested by others, is produced in such quantities that fifty dollars are given for the produce of a single tree.

But the one tree in which is now centred the promise and the hope of the Singapore planters is the *Cocoa-nut*. It does not appear to be indigenous; for none are found in the jungle; but it has long been introduced by the Malays. It is comparatively of late years, however, that European planters have looked upon it as a source of wealth, and foreseen that it may prove in course

of time to be the most important production of Singapore. The original Cocoa-nut plantations are yielding golden returns; and within the last ten years or less, a great impetus has been given to the propagation of a tree to which the sandy and poor soil of Singapore seems admirably adapted. The trees thrive, and the only drawback is that several years must elapse before they attain such a growth as to yield any recompense for the original expenditure. The uses of the tree are numerous; but it is to the oil that the planter looks for his reward. With proper machinery for separating this oil, the rapidly extending Cocoa-nut plantations bid fair to place Cocoa-nut oil in an important position among the exports from Singapore. The Cocoa-nuts, however, are not free from their enemies, in the shape of a large *Curculio*, as big or bigger than the English stag-beetle, which feeds upon the terminal bud of the palm-stem. When thus attacked, the bud dies, and the crown of leaves falls off, leaving the graceful Cocoa-nut tree a mere tall bare pole. Such bare poles I have seen representing all that remains of the Betel-nut Palm (*Areca Catechu*), which is subject to the attacks of a similar beetle. In Penang, thousands of cocoa-nuts are destroyed by the ravages of this insect. At the present moment, however, the cultivation of Cocoa-nuts is merely in its infancy; and the exports are confined to places in the immediate neighbourhood of Singapore.

P.S. In conversation with a gentleman who once cultivated Nutmegs on a large scale, I was assured by him that he could distinguish at least two forms of disease. In one of these it was deep-seated and radical. In many trees which he cut down for the purpose, he found that the central part of the main stem was turning black; and this gave the first indications of the onset of the disease, which was soon followed by the falling of the leaves and the whitening of the branches.

With regard to the other form of disease, he distinctly traced it to the attacks of what, from his description, must have been a small black aphis, which perforated the branches, and caused them to wither one by one. I find no two accounts to be precisely alike in respect to the manner of falling away of the trees; but all agree that their destruction was rapid, certain, and irremediable.

The same gentleman is cultivating the *Sago*-palm on a large scale, about eight miles from Singapore. The plantation (containing at present 10,000 trees) is still young, and will not begin to yield for about five years; but the flourishing state of the

trees, with the aid of a certain amount of manure, gives full promise of a successful result. When the trees are ready to cut, he intends to apply machinery to the preparation of the Sago; for, according to the present primitive modes of the natives, a man (Chinese) and his wife, their adult son and wife, and two children are employed a fortnight in preparing the product of a single tree.

Let me add, too, with regard to labour (which I have spoken of as comparatively dear), a Malay or a Chinese commands a price of 3½ to 4 dollars a month; while in Java 8 rupees is considered good wages; and, besides being doubly expensive in Singapore, the workman always takes two hours in the middle of the day for rest, and stops work the moment the clock strikes six; while they are so chary of their labour that it is necessary to have overseers to keep them at it.

CUTHBERT COLLINGWOOD.

Note on the Characters of the Genus *Canna*.

By G. DICKIE, M.D., F.L.S.

[Read May 2, 1867.]

IT will be necessary in the outset to state the opinions of different authorities respecting the characters of *Canna*, and of the Natural Order to which it is referred. Lindley says*, "filament petaloid, either entire or two-lobed, one of the lobes bearing the one-celled anther on its edge." Endlicher's statement is†, "filament petaloid, anther one-celled (the others all abortive), terminal, or adnate to the edge of the filament." A. Richard ‡ remarks, "one of the inner petaloid organs bears on one of its edges a free unilocular anther, surmounted by a small petaloid appendage, and prolonged below into a thicker, wider filament." Grisebach § describes the anther as "one-celled, marginal on a lateral petaloid filament." In the latest authority known to me ||, the statement is much the same as those already quoted, "a single one-celled stamen on the edge of a petaloid filament, the other abortive."

* 'Vegetable Kingdom,' p. 168.

† 'Genera Plantarum,' *Canna*.

‡ Dict. des Sc. Nat., *Canna*.

§ 'Flora of West Indies,' *Canna*.

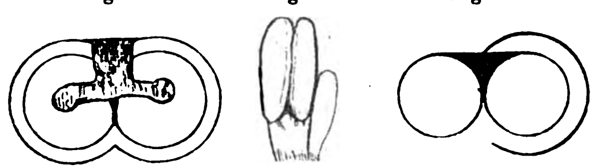
|| Duchartre, 'Eléments de Botanique' (1867), p. 926.

In the 'Prodromus Fl. Nov. Hollandiæ,' *Canna* is separated from *Scitamineæ*, because "a single lobe only of one of the lateral stamina has the appearance of an anther." Lindley gives as the diagnosis of *Zingiberaceæ* or *Scitamineæ*, "one stamen, anther two-celled," *Marantaceæ* or *Canneæ* presenting "one stamen, having half an anther." Grisebach, under the Order Scitamineæ, admits two tribes:—1. Zingiberaceæ, "anther two-celled, embracing the style." 2. Canneæ, "anther one-celled." A summary of these opinions respecting *Canna* appears to be this, "a single anther having only one cell, is supported on a petaloid filament, the other cell abortive."

Examination of the fully expanded flower only, would certainly lead to erroneous views respecting the series of parts nearest the style; the true structure can alone be ascertained by examining the unexpanded flower in different stages; and after carefully repeated observations I venture to offer the present remarks:—

In the expanded flower a superficial inspection leads to the conclusion that the anther is one-celled, the presence of a petaloid part projecting from it tending to confirm this opinion; but even in this state, more careful examination will reveal the remains of a longitudinal septum with a shallow groove on each side. In *Canna* we have one of those cases in which self-fecundation takes place, being, in fact, alone possible, the anther performing its function before the individual flower expands*. At early stages, the solitary stamen is much larger than any other parts more internal than the petals; in a bud of *Canna speciosa*, shortly before expansion, and about eight-tenths of an inch in length, the stamen, as yet sessile, was four-tenths of an inch long, perfectly developed, and evidently *two-celled*; in early stages it is in all respects similar to the typical organ as usually understood. Fig. 1 represents a transverse section when

Fig. 1. Fig. 2. Fig. 3.



it has almost reached the functional stage, or, in other words,

* Instances of self-fecundation, as the rule, may be seen in some *Goodeniaceæ*, *Selliera*, *Leschenaultia*, and in *Lobelia*, *Streptocarpus*, &c.

when the pollen is nearly mature; and fig. 2 shows the external appearance (front view) about the same period.

At the time of fecundation, the face of the anther and that of the flattened style are in close contact; and the pollen is shed before the flower opens, and may be seen adhering to the upper part of that organ: it is, in fact, swept out of the anther by the stigma; the face of the anther and upper part of style and stigma are at first firmly braced together. As already stated, close inspection is necessary in order to see that the shrivelled stamen in the newly-expanded flower retains, though rather indistinctly, the two-celled structure, which is obvious enough at an earlier period *.

The next question has reference to the nature of the petaloid organ to which the stamen adheres. The relation of the two, at an early stage, is seen in fig. 2, from which it is evident that, while the anther is very fully developed, the appendage is rudimentary. But, further, an important point to be noted is this: the petaloid part adheres by one edge to the back of the anther, along the line which corresponds to the connective; the other margin is free at the upper part, below it is partially adherent to the style, the entire appendage embracing rather more than one-half of the anther and part of the style, its function, apparently, being to keep those parts in close contact when the pollen is shed; fig. 3 represents a plan, in transverse section, illustrative of this. There may be several conjectures as to the nature of this petaloid appendage. First, it may be a portion of the anther, some holding the upper part to be the functionless cell, become petaloid, as well as the filament; its coexistence with two cells in the anther shows that this view must be abandoned: or, secondly, it may be a wing-like appendage of the back of the anther, which is not probable; thirdly, it may be considered to represent one of the stamens of the same series as the fertile one, adherent to this latter and petaloid. A. Richard, while he regarded the anther as one-celled, stated, moreover, that the petaloid filament ought to be held as formed by the "union of two stamens, one producing pollen, the other abortive, which is represented by the petaloid lamina, on one of the sides of which the anther is inserted."

This, undoubtedly, is the correct view, and appears to be indicated by the distribution of the vascular bundles, although,

* In the 'Botanical Magazine,' under *Canna lutea*, fig. 1085, there are remarks which, in part at least, are near the truth.

in this respect, there seems some irregularity, so far as my own observations go.

There appears to have been no doubt in referring the parts in *Canna* to the ordinary type of a Monocotyledonous flower. The true perianth consists of two series: one external and shorter, represents the calyx; another more internal, alternate with the former, is the corolla: then the petaloid organs between the corolla and the ovary will represent the stamens; those of the external series are all petaloid and functionless; one only of the inner series produces pollen, and, contrary to the usual opinion, is *two-celled*; one of the same series is petaloid, and in the mature flower is usually of large size; these two adhere in the way already described: the other stamen of this series is, in some species, so rudimentary that it may be readily overlooked.

I would, in conclusion, venture to suggest some alteration in the characters of the genus *Canna*.

Notes on the Botany of Mount Egmont and neighbourhood, New Zealand, February, 1867. By Mr. J. BUCHANAN. Communicated by J. D. HOOKER, M.D., F.R.S., V.P.L.S.

[Read June 20, 1867.]

HAVING arrived at New Plymouth on the 9th of February, preparations were commenced for the ascent of Mount Egmont, or, as the Maories call it, Taranaki; but, the weather being unfavourable for four days, I examined the neighbourhood of the town. Within a distance of six or seven miles there is nothing of interest, the clearings being mostly under English grasses. At the Sugar-loaves a few well-known shrubs are seen, such as *Olearia Solandri*, *Cassinia leptophylla*, *Cassinia Vauvilliersii*, *Coprosma acerosa*, *Corokia Cotoneaster*, *Pimelea arenaria*,—those of the sea-shore being the usual plants found there, such as *Apium australe*, *Mesembryanthemum australe*, and *Triglochin triandrum*.

In consulting with his Honour the Superintendent of Taranaki, who formed one of the party, it was determined to ascend the mountain by the side facing the west, as offering a more varied vegetation. By this route, the ranges trending towards the west are passed over at an altitude of nearly 4000 feet.

On the 13th, the weather having improved, a start was made in company with Mr. Richmond (Superintendent), Mr. Hursthouse, Mr. Henry (Nurseryman), who acted as guide, and a man to carry a load. It may be as well to mention here, in reference

to the supposed difficulty or danger of ascending Mount Egmont, that Mr. Henry and others are frequently up, and that, in fact, it is becoming an everyday trip to the Taranakites. A party of eight went up the day after us, and placed a flag on the top.

Although all who go up do not collect plants, still many do; and it is probable that no locality in New Zealand has been better searched. Plants have been passing to Britain from there through various channels for many years. All idea, therefore, of finding anything new may be dismissed for good; and the result of the present expedition has proved this.

Strong hopes were entertained by myself that many of the more minute plants of various genera known as Patch-plants, and which had been overlooked by collectors, were yet to be found; but, with the exception of *Raoulia australis*, no Patch-plant was seen on Mount Egmont. The idea that there were any originated in a mistake of the informant, who mistook large patches of a white moss (*Leucobryum candidum*) for flowering Patch-plants; and to a person who paid no attention to the subject, the mistake was very easy, as many small flowering plants, such as *Celmisia glandulosa*, *Forstera Bidwillii*, and *Euphrasia cuneata*, are often found growing among the moss.

Mr. Richmond says this front route is incomparably more laborious than the back one taken by him and his brothers previously; the only dangers in either ascent are being hemmed in by the creeks rising, and running short of provisions. Dry weather appears to be exceptional in this locality, the mountain being seldom all seen: clouds are found on some part of it every day; and one party may be at the bottom in miserable wet weather all day, while another may be enjoying beautiful sunshine at the top; this actually happened with our party and another.

From the town, by the Carrington road, the route lies for twelve miles through clearings in the bush on each side to Code's Hut at the last clearing. Here the horses are left; and everything carried on the back to the base of the cone at the head of the Rocky River, a distance of twenty miles.

From Code's Hut the track is entirely through bush, rising by a gradual and easy ascent to an elevation of 3500 feet, where the hill emerges from the bush into an open shrubby region. The bush passed through differs in nothing but an absence of the Fagus genera from the bush in Wellington; the *Vitex littoralis* is found on the lower levels, but it is not likely it goes

much further south; *Metrosideros tomentosa* is also found a few miles north of the town; but this appears to be its southern limit. Both of those trees are further south than they were supposed to be.

The most prominent trees of the bush on this range, are *Weinmannia racemosa* (the bark of which is stripped for tanning), *Metrosideros florida*, *Podocarpus Totara*, *Knightia excelsa*, *Dysoxylum spectabile*, *Dacrydium ferrugineum*, *Melicytus ramiflorus*, *Aristotelia racemosa*, *Drimys axillaris*, *Schefflera digitata*. The ferns also have a Wellington aspect:—*Cyathea dealbata*, and *C. medullaris*, *Dicksonia antarctica* and *D. squarrosa*, *Nephrodium velutinum* and *N. hispidum*, *Trichomanes reniforme*. Two very fine mosses are common, *Polytrichum dendroides* and *Dawsonia superba*.

The most prominent plants of the shrubby region, at an altitude of 3500 feet, are *Libocedrus Doniana*, which stands a giant amongst the rest, *Senecio elæagnifolius*, very abundant, *Olearia nitida* also common, *Panax Sinclairi*, *Coprosma cuneata*, *Pittosporum tenuifolium*, *Coriaria ruscifolia*, *Cassinia Vauvilliersii*, *Dracophyllum Urvillianum*.

On patches of open ground will be found *Veronica macrocarpa* and *Veronica lævis*, *Ranunculus nivicola*, *Ourisia macrophylla*, and many small plants, also found on the Cone, to be afterwards mentioned.

From the summit of this range the track descends very steep to the great swamp at the base of Mount Egmont. On this slope begins *Cordyline indivisa*, a very fine species, often dividing into many branches; this is a very different plant from the *Cordyline indivisa* of Dusky Bay.

Crossing the great swamp by one mile of heavy walking, the legs sinking deep in *Sphagnum* moss, the track passes up the bed of a creek for half a mile. This creek passes over Bell's Fall, becoming a branch of the Rocky River; it is subject to heavy floods. Leaving this creek, and crossing the watershed between it and another creek, the track follows down for a few hundred yards to the junction of the first creek from the left, falling from the Cone. It is from this junction that the track starts to rise to the Cone.

Arrangements should always be made to start from this point, to make the top and back again in one day: failing this precaution, none of our party made the extreme top; but this was of little consequence, as vegetation ceases entirely at 6500 feet.

From the junction to an altitude of 5000 feet the vegetation is identical with that of the range passed over. The plants collected here were *Ranunculus nivicola*, *Ourisia macrophylla*, *Epilobium glabellum* and *E. nummulariifolium*, *Euphrasia cuneata*, *Celmisia glandulosa* and *C. longifolia*, *Forstera Bidwillii* and *F. tenella*, *Drapetes Dieffenbachii*, *Wahlenbergia saxicola*, *Coriaria thymifolia* (this is certainly not the *C. angustissima* of the South), *Craspedia alpina*, *Dracophyllum rosmarinifolium*, *Veronica lævis*, *Gnaphalium prostratum*, and *Coprosma depressa*. *Poa foliosa* is apparently the only grass, and is the highest plant on the mountain; *Senecio latifolius* is very abundant between 2000 and 4000 feet.

The highest vegetation consists of a few scattered plants of *Claytonia australasica*, *Ligusticum aromaticum* and *L. piliferum*, *Gnaphalium prostratum*, *Wahlenbergia saxicola*, and *Poa foliosa*: these six may be found up to 6500 feet altitude.

Dieffenbach seems to have been satisfied that the line of perpetual snow on Mount Egmont was 7500 feet; this is a mistake, as at this season there were only two or three patches in the mouths of old craters a few hundred feet from the top, which may disappear before May. The ascent of the cone is very laborious, the gradient being very steep; that point having been reached which retains the volcanic *débris* only in temporary rest, quantities move downwards on the slightest occasions. The yielding mass of broken tufas and ashes affords little resistance to the feet in the ascent; and both hands and feet must be often used to prevent a loss of ground instead of a gain. As may be expected, not a trace of moisture exists, every drop sinking into the ground, and only appearing again at the bottom of the Cone, where the creeks burst suddenly out from the ground in considerable volume.

From the town to the top of the Cone and back again can be done in three days. Our party took four days, having spent a day in visiting Bell's Fall on the Rocky River.

The following list will give a better idea of the botany of the district:—

Plants collected and noted as being found on Mount Egmont and neighbourhood, February 1867.

Clematis indivisa and C. Colensoi.

Ranunculus nivicola, 4000 to 5000 feet.

Drimys axillaris, two varieties.

Viola Cunninghamii.

Melicytus ramiflorus (lanceolatus), 2000 feet. This plant was also collected to the north of Auckland in 1866.

Pittosporum tenuifolium, crassifolium, eugenioides, cornifolium.

Claytonia australasica, 5000 to 6000 feet.
Hoheria populnea, vars. lanceolata and angustifolia.
Aristotelia racemosa.
Elæocarpus dentatus.
Linum monogynum.
Melicope ternata.
Dysoxylum spectabile.
Pennantia corymbosa.
Discaria Toumatou.
Dodonea viscosa.
Alectryon excelsum.
Corynocarpus lævigata.
Coriaria ruscifolia and thymifolia. The last species has always flat branches, which the Mount Egmont plant is found to have. *C. angustissima* is not found in this locality: its form is like a bottle-brush, with fine line-like leaves.
Sophora tetraptera, var. grandiflora.
Acæna Sanguisorba.
Carpodetus serratus.
Weinmannia racemosa. The prevailing tree in Taranaki. Bark used in tanning.
Leptospermum ericoides.
—— scoparium.
Metrosideros tomentosa. Found as far south as the Waitari River.
—— florida, lucida, scandens.
Myrtus bullata, obcordata, and pedunculata.
Eugenia Maire.
Fuchsia excorticata.
Gunnera (monoica?), 4000 feet.
Hydrocotyle elongata, muscosa.
Epilobium glabellum, 4000 feet.
—— nummulariifolium.
Passiflora tetrandra.
Mesembryanthemum australe.
Ligusticum piliferum and aromaticum.
Apium australe.
Aciphylla squarrosa.
Panax simplex, Edgerleyi, crassifolium, arboreum (Sinclairii, 4000 feet).
Schefflera digitata.
Griselina lucida and littoralis.
Corokia Cotoneaster.
Loranthus tetrapetalus and flavidus.
Alseuosmia Banksii.
Coprosma acutifolia. Probably the Kermadec plant; it is described as having a bell flower, like Fuchsia, and an orange berry.
—— fœtidissima.
—— grandifolia.
—— parviflora.
—— robusta.
—— repens, 4000 feet.
—— cuneata, 4000 feet.
—— depressa, 4000 feet.
Nertera dichondræfolia.
Asperula perpusilla.
Olearia nitida (4000 feet), ilicifolia, Cunninghamii, Forsteri, Solandri.
Ozothamnus microphyllus, 4000 feet.
Celmisia glandulosa (5000 feet), longifolia (4000 feet).
Craspedia fimbriata.
Cassinea Vauvilliersii and retorta.
Raoulia australis.
Gnaphalium prostratum, Keriense.
Senecio elæagnifolius, 4000 feet; latifolius, 2000 feet; glastifolius, 2000 feet.
Brachyglottis repanda.
Forstera Bidwillii, 5000 feet; tenella, 4000 feet.
Wahlenbergia saxicola, 5000 feet.
Gaultheria antipoda, 4000 feet; rupestris, 4000 feet. G. oppositifolia not seen.
Cyathodes acerosa, empetrifolia, 4000 feet.
Leucopogon Frazeri.

Pentachondra pumila.
Dracophyllum Urvillei (rosmarinifolium?).
Muhlenbeckia adpressa.
Myrsine salicina, Urvillei.
Samolus littoralis.
Parsonsia albiflora, rosea.
Geniostoma ligustrifolium.
Exarrhena petiolata.
Solanum aviculare.
Veronica salicifolia, macrocarpa; lævis, 4000 feet.
Ourisia macrophylla, 2000 to 4000 feet.
Euphrasia cuneata, 4000 feet.
Rhabdothamnus Solandri.
Vitex littoralis.
Myoporum lætum.
Nesodaphne Tawa.
Atherosperma Novæ Zelandiæ.
Hedycarya dentata.
Knightia excelsa.
Pimelea arenaria.
Drapetes Dieffenbachii.
Euphorbia glauca.
Epicarpurus microphyllus.
Elatostemma rugosum.
Ascarina lucida.
Piper excelsum.
Peperomia Urvilleana.
Libocedrus Doniana.
Podocarpus ferruginea, Totara, spicata, dacrydioides.
Dacrydium cupressinum.
Phyllocladus trichomanoides.
Libertia macrantha.
Typha angustifolia.
Freycinetia Banksii.
Triglochin triandrum.
Rhipogonum scandens.
Callixene parviflora.
Arthropodium cirrhatum.
Cordyline australis, Banksii, and a small stemless species very like young plants of *C. Banksii*; it has a large head of white, sweet-smelling flowers.
Astelia Banksii.
Anthericum Hookeri.
Phormium tenax and Colensoi.
Areca sapida.

The following Orchids only could be determined:—

Earina mucronata.
—— autumnalis.
Dendrobium Cunninghamii.
Gastrodia Cunninghamii.

Two Grasses only were collected:—

Poa australis and Poa foliosa, 5000 feet.

And the following Ferns:—

Gleichenia Cunninghamii.
Cyathea dealbata, medullaris, Smithii.
Alsophylla Colensoi.
Dicksonia squarrosa, antarctica.
Hymenophyllum tunbridgense, unilaterale (a rare fern), minimum.
—— bivalve, rarum, crispatum, scabrum, æruginosum.
Trichomanes venosum, reniforme.
Davallia Novæ Zelandiæ.

Notes on the Botany of the Province of Marlborough, made during a visit there in the months of November, December, and January, 1866-67. By Mr. J. Buchanan. Communicated by J. D. Hooker, M.D., F.R.S., V.P.L.S.

[Read June 20, 1867.]

The botany of Marlborough is well defined in its distribution—the greater portion of the country being open pasture, while the bush is confined chiefly to the gullies and lower slopes of the mountains; if to this is added an alpine region including all above 4000 feet, the three divisions into which the district is naturally divided will be easily understood.

The district may be described as a series of great mountain-ranges, attaining in many places altitudes of from 5000 to 9700 feet, and rising like islands from a sea of low land, terraced and undulating. The pasture varies in quality as certain geological influences prevail, the terrace-land being principally gravels and sands, and the lower hills lime and marl. Aridity rules; and these areas carry but a sparse and little-nutritive pasture of a few species of grass. Repeated burnings of the country are evidently reducing the number of species of plants; and a country naturally arid from its geological nature will, by this treatment, become more so.

At the junction of the lower hills with the ranges the pasture improves; there is found a richer soil and more moisture; and in the numerous mountain-valleys and mountain-slopes up to 3000 feet the pasture is superior.

The bush of this district is almost identical with that of the east coast of Wellington in the North Island. There are still found here *Corynocarpus lævigata*, *Nesodaphne Tawa*, *Areca sapida*, *Knightia excelsa*, and *Cyathea medullaris*; these pass into the province of Canterbury on the east coast as far as Banks Peninsula. The prevailing tree in the bush is *Fagus Solandri*, ascending in the gulleys sometimes to 5000 feet. The wood of this tree is perfectly worthless where it is exposed to the weather; yet it has been used extensively for telegraphic posts, many of which are already rotten.

Before giving a list of the plants of the district, the most of which were collected, it would be as well to describe the vegetation of one river-valley as the type of the others, and the ascent at one place of the Kaikoura Mountains. Taking the Clarence River valley, and starting from the sea, sand dunes are passed over with the almost uniform vegetation of such places; *Coprosma*

acerosa, Convolvulus Soldanella, Euphorbia glauca, Desmoschœnus spiralis are always present. Swampy ground near sand dunes has a few other plants peculiar there—*Gunnera monoica, Senecio lautus, Samolus littoralis, Cotula coronopifolia, Sellieria radicans, Epilobium alsinoides.*

Continuing up the river-flats, the vegetation is grassy, with a strip of shrubs on the banks of the river, and trees and shrubs in the gulleys of the terraces bounding the flats. The grasses collected in the different valleys were uniformly the same—*Poa Colensoi, Poa australis, Dichelachne crinita, Triticum scabrum, Trisetum antarcticum, Agrostis æmula, Danthonia Raoulia, Danthonia semiannularis, Kœleria cristata, Agrostis*: the most of these grasses are found up to an altitude of 3000 feet.

There are a few shrubs of the river-flats of a very local and limited distribution. *Senecio Monroi*, a beautiful shrub, was found in flower in December; the whole plant is fragrant; it ranges from the sea-level to 4000 feet. *Notospartium Carmichæliæ*, with its peculiar whipcord-like foliage and masses of pink flowers, is perhaps one of the most showy shrubs of the country. These two are worthy of attention as garden-plants, and no doubt would become favourites. Then, again, the leafless *Clematis*, with its tendrilled stems twisting on themselves till they form an upright mass of interlaced cords; the female plant in seed is very showy.

The frequent burnings prevent a great variety of shrubs. *Cassinia leptophylla, Carmichælia flagelliformis, Leptospermum scoparium*, and *Muhlenbeckia complexa* form the principal. There are many small plants generally found in open grass-lands, such as *Hypericum gramineum, Carmichælia nana, Convolvulus erubescens, Prasophyllum Colensoi.*

After passing up the valley five miles, the ascent of the Kaikouras is begun by striking up a transverse spur to the main range. This spur of five miles attains an altitude of 3000 feet as it nears the mountain; during this distance there are few additional plants found, the country being open and grassy. *Celmisia spectabilis* and *Anthericum Hookeri* begin, which, further up, occupy nearly the whole ground; *Phormium tenax, Coriaria ruscifolia* and *Pteris aquilina*, the three prevailing plants on scrubby ground in the middle island, are common, with *Rubus australis, Arundo conspicua, Discaria Toumatou* and *Muhlenbeckia complexa*, forming patches on the ground, *Aciphylla squarrosa* also too common.

The main range now reached, called the Looker-on Kaikouras,

is a long sharp ridge, its northern extremity commencing at the Clarence River, and, rising in altitude for seven or eight miles, culminates at Kaitaran, its highest point, 8700 feet, thence continuing south at lower elevations. From the junction of the transverse spur or ridge the distance to the top is between three and four miles; the track can only be followed with difficulty along the sharp ridge.

There is little difference in the vegetation up to 5000 feet, *Anthericum Hookeri* at 4000 feet covering large patches of ground, and, when in flower, making the mountain-side yellow. Treading among the leaves of this plant produces a disagreeable odour; it is avoided by all animals as food, and may be called a nuisance.

Between 4000 and 5000 feet there is little else to be seen but *Celmisia spectabilis* and *Celmisia longifolia*; at this elevation the *Aciphylla squarrosa* has ceased to be troublesome. When climbing steeps, this plant, being hidden among others, is often dangerous for the eyes, if the feet should slip and the traveller fall on his face.

Between 5000 and 6000 feet, the mountain assumes an open and bare appearance; everything has disappeared but the true alpines *Euphrasia antarctica* and *E. Monroi*, *Myosotis capitata* and *M. Traversii*, *Veronica Hectori*, *V. epacridea*, *V. tetratheca*, and *V. pimelioides*, *Aciphylla Monroi*, *Ranunculus pinguis*, *Cyathodes empetrifolia*, *Ligusticum aromaticum*, *Swainsonia Novæ Zelandiæ*, *Ozothamnus microphyllus*, *Drapetes Dieffenbachii*, *Dracophyllum rosmarinifolium*. Beyond 6000 feet the only plant seen was *Cotula pyrethrifolia*.

Specimens of the larger shrubs are found as high as 5000 feet, such as *Senecio Monroi*, *Olearia nummulariæfolia* and *Cassinea Vauvilliersi*.

Above 6000 feet the mountain becomes, in the connecting saddles, a very sharp precipitous ridge with shoots of dry *débris* on both sides, where, if a stone is placed, it dashes down with unchecked velocity for several thousand feet. No snow lies on the highest parts of the mountain, having no hold, although it was seen at lower levels. The extreme height can only be reached with danger, the last saddle having numerous loose rocks on the edge of the ridge, doubtful on which side to fall; and, as they would have to be clambered over, they might be put in motion. It is not worth the risk, as the last thousand feet is perfectly barren, and there is little difference in the view from the second-last knob, it being only a few hundred feet less in altitude.

These higher mountains do not seem to have anything different from those of lower altitudes of 4000 to 6000 feet, several of which were examined in the district; and the Looker-on Kaikouras are unfavourable as fields for alpine plants; there are no flat spots with wet bottoms or slopes of *débris* at rest.

The season being exceptionally wet, the principal Kaikouras were not examined; but there is little doubt that the shepherds employed to search for plants there have pretty well exhausted them.

The following is a list of plants collected or noted as being found in the district:—

Clematis indivisa.
—— Colensoi.
——, sp., leafless. River-valleys and sea-coast.
Ranunculus pinguis. 4000–5000 ft.
—— multiscapus.
—— rivularis.
Caltha Novæ Zelandiæ. 4000 feet.
Drimys axillaris, southern variety.
Nasturtium palustre.
Cardamine depressa.
Viola Cunninghamii.
Melicytus ramiflorus.
Pittosporum tenuifolium, fasciculatum, and eugenioides.
Gypsophila tubulosa.
Colobanthus subulatus and acicularis.
Spergularia rubra.
Hypericum gramineum.
Plagianthus Lyallii. This plant has the leaves sometimes not cordate.
Hoheria populnea, var. angustifolia.
Aristotelia racemosa and fruticosa.
Elæocarpus dentatus.
Linum monogynum.
Geranium sessiliflorum.
Erodium cicutarium.
Oxalis corniculata.
Disoxylum spectabile.
Pennantia corymbosa.
Discaria toumatou.
Dodonea viscosa.
Alectryon excelsum.
Corynocarpus lævigata.
Coriaria ruscifolia, a small var. with waved edges on the leaves.
Carmichaelia nana, odorata, and flagelliformis.
Notospartium Carmichaelia.
Swainsonia Novæ Zelandiæ.
Sophora tetraptera, var. grandiflora.
Rubus australis (three varieties).
Geum urbanum and parviflorum.
Acæna sanguisorbæ.
Carpodetus serratus.
Weinmannia racemosa.
Drosera auriculata.
Gunnera monoica.
Leptospermum scoparium and ericoides.
Metrosideros scandens.
—— lucida. Queen Charlotte's Sound.
Myrtus pedunculata and bullata.
Fuchsia excorticata.
Epilobium pubens, melanocaulon, Billardieri, glabellum.
Passiflora tetrandra. Sea-coast.
Mesembryanthemum australe.
Tetragonia expansa.
Hydrocotyle Novæ Zelandiæ.
Apium australe.
Eryngium vesiculosum.
Aciphylla squarrosa, Colensoi, and Monroi.

Ligusticum piliferum and aromaticum.
Daucus carota.
Panax simplex, Edgerleyi, crassifolium and arboreum.
Schefflera digitata.
Griselina lucida and littoralis.
Loranthus flavidus (on Fagus Solandri).
Tupeia antarctica.
Coprosma lucida, petiolata, rhamnoides, fœtidissima, acerosa.
Nertera dichondræfolia.
Olearia insignis, nitida, Cunninghamii, nummulariæfolia, Forsteræ, virgata.
Celmisia spectabilis, longifolia, Monroi.
Vittadenia australis.
Brachycome pinnata.
Cotula coronopifolia, dioica, pyrethrifolia.
Craspedia fimbriata and alpina.
Cassinia Vauvilliersii, leptophylla, and fulvida.
Ozothamnus selago and depressus.
Raoulia tenuicaulis, glabra, australis, mammillaris.
Gnaphalium bellidioides and filicaulis.
Haastia pulvinaris. 5000 feet.
Senecio Haastii, lautus, Colensoi, Monroi, and a species with entire round leaves ½–1 in. in diameter. Specimens sent to Dr. Hooker.
Brachyglottis repanda.
Traversia baccharoides. 2000 feet, on Mount Monat.
Wahlenbergia gracilis and saxicola.
Lobelia anceps.
Pratia angulata.
Gaultheria antipoda and rupestris.
Cyathodes acerosa, empetrifolia and Colensoi.
Leucopogon Frazeri.
Pentachondra pumila.
Dracophyllum rosmarinifolium. 5000 feet.
Myrsine Urvillei and salicina.
Samolus littoralis.
Parsonsia albiflora and rosea.
Geniostoma ligustrifolia.
Gentiana pleurogynoides.
Myosotis australis, capitata, and Traversii.
Convolvulus soldanella and erubescens.
Solanum aviculare.
Veronica salicifolia, Traversii, vernicosa, epacridea, tetratheca, Hectori, Hulkeana.
Euphrasia antarctica and Monroi.
Myoporum lætum.
Mentha Cunninghamii.
Plantaga Raoulii.
Chenopodium triandrum.
Salicornia indica.
Scleranthus biflorus.
Muhlenbeckia ephedrioides, complexa, and adpressa.
Rumex flexuosus.
Nesodaphne Tawa.
Atherosperma Novæ Zelandiæ.
Hedycarya dentata.
Knightia excelsa.
Pimelia Lyallii and Gnidia.
Drapetes Dieffenbachii.
Euphorbia glauca.
Fagus fusca and Solandri.
Epicarpurus microphyllus.
Urtica ferox.
Ascarina lucida.
Piper excelsum.
Podocarpus ferruginea, (nivalis, 5000 feet,) Totara, spicata, dacrydioides.
Dacrydium cupressinum.
Phyllocladus alpinus.
Earina mucronata and autumnalis.
Dendrobium Cunninghamii.
Gastrodia Cunninghamii.
Pterostylis micromega.

Thelymitra longifolia.
Prasophyllum Colensoi.
Corysanthes rotundifolia.
Libertia ixioides and macrantha.
Typha angustifolia.
Rhipogonum scandens.
Callixene parviflora.
Cordyline australis and Banksii.
Astelia nervosa and Banksii.
Anthericum Hookeri. 4000 feet.
Phormium tenax and Colensoi.
Areca sapida.
Potamogeton natans.
Juncus Novæ Zelandiæ.
Luzula Oldfieldii (5000 feet) and campestris.
Scirpus triqueter, maritimus.
Leptocarpus simplex.
Cyperus ustulatus.
Schœnus pauciflorus.
Desmoschœnus spiralis.
Isolepis riparia.
Eleocharis gracilis.
Carex Gaudichaudiana, virgata, cataractæ.
Hierochloë alpina, 5000 feet.
Echinopogon ovatus.
Dichelachne crinita and sciurea.
Agrostis æmula, canina var. β (4000 feet), avenoides.
Arundo conspicua.
Danthonia Cunninghamii, Raoulii, semiannularis.
Kœleria cristata.
Trisetum antarcticum, subspicatum.
Glyceria stricta.
Poa australis and Colensoi.
Festuca ovina, duriuscula.
Bromus mollis (introduced).
Triticum scabrum.

Ferns.

Cyathea dealbata, medullaris, Smithii.
Dicksonia antarctica, squarrosa.
Hymenophyllum minimum, multifidum, rarum, pulcherrimum, dilatatum, crispatum, polyanthos, scabrum.
Trichomanes reniforme, venosum.
Davallia Novæ Zelandiæ.
Lindsæa trichomanoides.
Adiantum Cunninghamii.
Hypolepis tenuifolia, distans.
Cheilanthes tenuifolia.
Pelliea falcata, rotundifolia.
Pteris aquilina, tremula, scabrula, incisa, macilenta.
Lomaria filiformis, procera, fluviatilis, elongata, discolor, alpina.
Asplenium lucidum, flabellifolium. falcatum, Hookerianum, bulbiferum, flaccidum.
Aspidium vestitum, aristatum, coriaceum.
Nephrodium decompositum, hispidum.
Polypodium australe, grammitidis, rugulosum, pennigerum, rupestre, Cunninghamii, pustulatum, Billardieri.
Leptopteris hymenophylloides, superba.
Lycopodium selago, Billardieri, densum, clavatum, scariosum, volubile.
Tmesipteris Forsteri.
Azolla rubra.

Lahul, its Flora and Vegetable products &c. From communications received from the Rev. Heinrich Jaeschke, of the Moravian Mission. By J. E. T. Aitchison, M.D., F.R.C.S.E., F.L.S. &c.

[Read April 20, 1865.]

The term "Buran" is the name of the language spoken chiefly over Lahul and Kunwar, where it is called "Tiber-skad." It belongs neither to the Tibetan nor Sanscritian family. The synonyms in the paper, except where marked as belonging to another language, will be understood to belong to the "Buran." These are spelt in accordance with the pronunciation used by the Lahulees, and not according to the correct Tibetan spelling.

Pronounce *a* as in *father*, *barley*.
" *e* as in *net*, or *ay* in *May*.
" *i* as in *machine*.
" *o* as in *so*.
" *u* as in *sure*.
" *zh* as sibilant *s* in *leisure*.

Lahul.

"Lahul consists of the valleys of the headwaters of the Chenab."* It is surrounded by a circle of high mountains, which on the south-west has a break in it; and through this opening passes the Chenab. The headwaters consist mainly of two streams. One, called the Chundra, which may, indeed, be regarded as the true source of the Chenab, springs from the base of the mountains that bound Lahul to the north, at the most eastern limit of Lahul, running parallel and close to the bases of the mountains that bound Lahul on the east; and, at the union of the hills that bound Lahul on the east with those that help to encircle it on the south, the river makes a rapid bend to the west, keeping a west-by-north course parallel to the hills that form the southern boundary, and from this continues in the course of the Chenab, passing through the opening of the circle of mountains at an elevation of about 8500 feet. The second river, that joins with the Chundra to form the Chenab, is the Bhaga. This rises close to the Bara-Lacha pass, runs south by east, and joins the Chundra a few miles before its passage through the opening in the hills. The union of these two rivers forms the Chundra-Bhaga or Chenab. This runs for some little distance through the province of Lahul.

* 'Flora Indica,' by J. D. Hooker and T. Thompson.

The country from which the accompanying plants were obtained is the Chundra valley as far as Koksar and up to the Rotang pass (13,000 feet), along the whole of the Bhaga valley up to the Bara-Lacha pass (16,000 feet), and in the valley of that portion of the Chenab river that is in Lahul.

The Chundra valley above Koksar was not visited by Mr. Jaeschke, but was by Mr. Heyde; and from what he saw of it, he considered that it would be likely to prove of much interest to the botanist, as it presented not a few plants that do not occur in the rest of Lahul, and apparently seemed to enjoy a larger quantity of rain and moisture, as seen by the presence of *Polypodium lineare* (*Phymatodes*), Thunb.

The Lahulees do not recognize any of the above rivers by any further term than that of "river," which they apply to all large streams indiscriminately. The names Chundra-Bhaga and Chenab are of Hindoo origin.

Where the union of the two rivers takes place to form the Chenab, the altitude is 9000 feet. The bed of the Chenab through Lahul does not average above 8500 feet. The land forming this portion of the Chenab valley is by the natives termed "Manchat" or the "low land" or the "lower valley."

At Kyelang, a small village on the Bhaga, with an elevation of 9500 feet, is the Mission station.

What is spoken of in this paper as "The Valley of Lahul" may be considered to average from 8500 to 10,000 feet in elevation; and it is to be understood that all plants stated to occur in the "lower valley," reach only an elevation of 9000 feet, and hence can only occur in the Chenab valley,—as, for instance, the Walnut, which is only to be met with in the "lower valley."

Climate.—Spring commences about the middle of April, and is usually ushered in by the springing of grass. In ordinary years the wild gooseberry will shew its leaves about the latter end of April. Snow lies at Kyelang to nearly the end of April, and then rapidly vanishes under the influence of the sun's rays, which daily become more powerful.

The dandelion, No. 6, *Iris Kamaonensis*, Wall., and No. 63, *Gentiana*, sp. (unnamed), are the first plants to show their early flowers, soon, however, followed by the Anemones. *Tussilago farfara*, No. 248, flowers throughout the whole winter on ground that may be free from snow.

In early spring the natives are very badly off for food, both for

themselves and chiefly for their cattle; an early season therefore is hailed and looked forward to with great joy. The natives at this time make use largely of the young leaves of the dandelion, and many other plants, cooked in the form of spinach, more especially the young leaves of No. 85, *Eremurus spectabilis*, Bieb., which grows in great luxuriance in particular localities. This was considered by the Mission a very good vegetable.

Rain, in but very small quantities, falls through the summer from May to September. During 1864 for three months the rain-gauge at Kyelang marked less than nine-tenths of an inch; but it must be remembered that this was an unusually dry season.

Ploughing and sowing are carried out extensively in May.

The harvest is collected about the middle of September; and frost begins to be felt early in October, not unfrequently in the latter part of September. From this time the temperature very gradually begins to fall; and snow not unfrequently makes its appearance about the middle of October. This, however, is only the forerunner of winter, as usually, on the whole, October, November, and December are lovely, clear, dry, frosty months. The great snow-falls introducing dead winter occur about the beginning or middle of January; and from this time to the beginning or middle of April the vast expanse of country is one mass of snow, the people for these four months being all but confined to their houses.

Ice does not occur upon any of the streams, from the great rapidity with which they run; occasionally, however, on their edges a little may be found.

Relative to the snow-limit of this district we would refer the reader to Cunningham 'on Ladak and the surrounding countries.'

At 16,000 feet, the Bara-Lacha pass, during July, August, and perhaps September, may be crossed without passing through or touching snow. The top of the Kardang hill, of an elevation of 15,000 feet (from a rough trigonometrical measurement), in ordinary years is free of snow in July, beginning again to be covered in October.

A snow bridge has now existed for several years at 15,000 feet, not far from the Bara-Lacha pass.

The general appearance of the Lahul valley, up to 10,000 feet, in midsummer is that of being richly cultivated and very verdant; but to keep up this appearance, an easy access to and a liberal supply of water for the irrigation of the crops under cultivation is essen-

tial. This farming is carried out more upon the principle of gardening than of field cultivation, as without careful irrigation the crops would completely fail from the extreme dryness of the climate.

At about 11,000 feet cultivation ceases; and above this height, with the exception of where the forests exist, the general aspect of the country is barren and arid in the extreme.

The inhabited part of the Chundra valley from Koksar to the union of the two rivers, presents a barren treeless aspect. The left bank is totally uninhabited and uncultivated, due chiefly to the great steepness of the rocks, and the presence of numerous precipices; a few miles, however, before the junction of the two rivers some small villages occur, and some cultivation, with one of the two large forests of *Pinus excelsa*, called the "Mooling forest;" whereas, on the right bank, we have a tolerable number of villages with a much more extensive cultivation.

From the junction of the Bhaga, passing up the Bhaga river, there are villages and cultivation upon both banks of the river (though more on the northern bank) for ten miles; here the second forest of *Pinus excelsa* exists, viz. the "Kardang," also on the left bank of the river.

At the village of Tino, which is seven miles, as the crow flies, beyond Kardang, all the cultivation on the eastern bank ceases; from this point, passing upwards, a few villages at some distance from each other are to be met with on the western bank, the last village being "Dharchee," 11,000 feet in elevation, and about nine miles, as the crow flies, from "Tino." At the last house, "Patseo," a day's march further up, no cultivation exists. From Darchee upwards the valley becames much contracted, narrower and in every way more sterile; the juniper, which existed as a tree, is now but a poor stunted shrub; and this even becomes rare.

From the union of the two rivers to the Chumba frontier, the country, as already stated, is called the "low land" or "lower valley;" cultivation here is much more extensive than in the upper valleys spoken of; other vegetable products than those met with in the higher valleys occur, as, for instance, the *Abies Smithiana*, Walnut, and a species of *Persica* occur wild, with the Apricot freely naturalized and ripening its fruit.

Here spring is much earlier in its advent, and necessarily seed-time is earlier, giving a longer summer and autumn, and permitting of the occasional cultivation of wheat, a thing quite un-

known in any other part of Lahul. This portion is chiefly populated by Hindoos; the villages present a more thriving appearance, contain many better houses, some of which are fairly built with timber.

In the cultivation of their fields the common wooden plough of northern India, pointed with iron, is what is in general use, worked usually with a pair of "Dzo," viz. a hybrid between the Cow and Yak.

For ploughing, carrying loads, or other kinds of work, this hybrid is considered superior to either of its parents.

Irrigation, of necessity, as already stated, is in every case carried out. All streams of water that are near land, that can be possibly applied to the purposes of cultivation are highly valued and most jealously cared for. The water is conveyed to and through the fields by means of built channels; and the fields are flooded with it as occasion may require.

Crops.—Barley and Buckwheat are the main crops; anything else is quite exceptional.

Barley, "Nai." Of this there are three recognized varieties, all largely grown.

Buckwheat, "Drawo." There are two kinds, one much less cultivated than the other.

Wheat, "Dro, Do." Has but very rarely been raised, and that only in the lower valley. The natives affirm that the wheat raised in Lahul is of a very much better quality than that grown in Kullu.

The Amaranths are not cultivated in Lahul, their limit being Kullu.

The chief food of the Lahulee is Buck-wheat; from this two kinds of flour are made:—one called "Drapé," of the raw grain; this is boiled with water and eaten as gruel; the other, "Mukusu" (Bunano), made from the boiled and then roasted grain. This "Mukusu" flour is either made into a sort of girdle-cake, or, by mixing with it "Chang" in two proportions, where there is little, dumplings are formed, used chiefly for being carried in travelling, or, when in some quantity, into a kind of gruel, and eaten at once from the common drinking-cup. Both these latter dishes are cold ones. Ladakees, accustomed to a more refined cookery, look upon this Buckwheat diet rather contemptuously.

Wheaten flour is eaten largely, made into a sort of soup, with such vegetables as can be obtained (as, in spring, dandelions and

other field-weeds, in summer chiefly the leaves of Buck-wheat); and this soup forms the chief morning meal.

Rice-flour is used much in the same way as the wheaten by the poorer people; the wealthier classes eat it more after the Ladak fashion, boiled thickly with butter, and mixed with sugar, apricots, and other condiments.

Barley-flour is used in the same way as wheat-flour. As a sort of delicacy, roasted barley is offered to visiting friends or acquaintances, and is thus frequently eaten.

The large tap-root of No. 50, *Codonopsis ovata*, Benth., called "Lu-dut," is dried and converted into flour, and thus mixed with either Barley or Buckwheat to increase the amount at little or no cost.

Vegetables.—Cultivated there are none; but the young leaves and stems of many wild plants are eaten largely by the natives, more especially in spring, as of the dandelion, "Baran."

No. 85. *Eremurus spectabilis*, Bieb., "Boe."

No. 50. *Codonopsis ovata*, Benth., "Loodoot."

No. 95. *Allium* (unnamed sp.).

No. 111. *Rheum Moorcroftianum*, Meis.

No. 127. *Sedum Tibeticum*, H. f. & T.

No. 217. *Origanum normale*, Don.

No. 230. *Cicer songaricum*, Steph.

No. 266. *Tragopogon major*, Jacq.

No. 298. *Sedum rhodiola*, DC., called "Shrolo."

Previously to the arrival of this Mission amongst the Lahulees, they took not the slightest trouble to add to their luxuries. This might be due to several causes,—no regard for taste, lazy habits, or most likely to the fact that they prefer the cultivation of a more paying and saleable commodity to that of a luxury.

They know of turnips, "Mokali," which are cultivated in Ladak, and the dry roots of which are not unfrequently brought to Lahul.

Mushrooms, "Moksha," are found, but are not common; they are used by the natives. In Kullu they are much more common, and there are regularly used.

The Mission gave a great stimulus to this department of agriculture by the introduction of the potatoe during the year 1857. These are much liked by the natives; called "Alu" (Hind.), small patches of these are now being grown. Along with the potatoe it was attempted to introduce many other English vegetables. Of these, the Lahulees preferred the lettuce, cabbage, and turnips; yet although they admit these are not bad things in their

way they will not take the trouble to grow them. The great drawback to vegetable-cultivation is the want of proper hedges to protect the gardens from the numerous cattle. This, there can be no doubt, could be easily remedied by making good hedges of No. 294, *Hippophae rhamnoides*, L., or of the abundant wild roses which are so prolific throughout the valley; but they are such an indolent race of people that it is to be feared they would not care to go to this extra trouble.

Fruits.—The district produces but few fruits; and of these only one or two are in any way palatable or useful. Those which suit the native palate are:—the wild strawberry, "Paljoo," of which there is a great abundance in the valley; No 54 *a*, *Ribes Himalaiense*, Decaisne, a sweetish acid fruit; No. 189, *Pyrus baccata*, Wall. (this is a sweet fruit, the size of a small cherry, called "*Litsee*," and much eaten); also No. 188, *Pyrus malus*, L., which is a sour bitter fruit, a kind of apple, called by the natives "Kushoo," this term being also applied to the apple. A Cotoneaster, growing in the "lower valley," yields a small berry, to which they are also partial.

The fruits found good and useful by the Mission were the Wild Strawberry, which is very highly flavoured, the flavour and size becoming greatly improved upon cultivation, making an excellent stew. The fruit of No 294, *Hippophae rhamnoides*, L., is only good after being made into a preserve, with at least half the weight of sugar; and then it makes really an excellent preserve. The natives, however, do not use it at all. A recipe for making the above was met with in a Tibetan pharmacopœia, where the tree is called "Star-bu."

Apricot-trees grow in the "Lower valley;" and there the fruit ripens, called "Chuli." It is, however, an uncommon tree to be seen near a village above 9000 feet; and then either the children eat all the fruit before it is ripe, or the tree is unable to ripen its fruit at an altitude above this. Mr. Jaeschke never saw ripe fruit on the trees near Kyelang. Dry apricots, in the form of a cake called "Pating," are always to be found in the houses of the richer natives, and usually form what is given as the introductory present, a ceremony always gone through towards strangers.

Walnuts, "Darga." Although the tree grows in the "Lower valley," the fruit is not common, and is generally imported.

Of grapes there are none. Pears and peaches are quite unknown.

Beverages.—Instead of tea, which assists largely towards the

diet of the richer classes, cooked with "ghee" (clarified butter) and salt into a kind of thick soup having the consistency of chocolate, the shepherds and poorer people often use the leaves of No. 186, *Potentilla Inglisii*, Royle, which is a very fair substitute, and by them called "Spang-jha" or "Moss-tea."

From barley, as well as from rice ("Drai," "Dai"), a kind of beer is made, called "Chung." The Ladakees prepare it by an infusion of water on the boiled barley; the Lahulees squeeze the latter out with their hands. The Ladak Chung is therefore a tolerably clear fluid of a pale yellow colour, similar to the "vin ordinaire" of France, even in taste, when it is good; the Lahul Chung is a duller, dark-grey, thickish liquid, looking very dirty, and with a prevailing taste of malt. In the upper part of Kullu they prepare "Chung" from rice, but also by squeezing, and, therefore, of the same appearance, and similar in taste to the barley "Chung" of Lahul.

Notwithstanding that Chung is by no means a strong drink, the Lahulees do get drunk on it, from the excessive quantities they swill, thus resembling the German beer-drinkers. In making Chung a ferment is used, called "Pab," imported from Ladak in the form of a dry yeast. The Lahulees admit their ignorance as to its nature and their non-ability to make the Chung without it.

In the monasteries, and houses of the great, from barley is made a very strong brandy called "Arrack" (Hind.), with which strangers are usually treated: from its name being of Hindoo origin there can be no doubt that the knowledge of developing this spirit came also from the south.

Hops were introduced by the Mission for the first time in 1862. One plant bore a little fruit during 1863; and during the spring of 1864 the young shoots were being thrown up with great vigour; and at present to all intents and purposes there seems to be every reason to consider that their introduction will prove sucessful.

Tobacco, "Tamak" (Hind.). None is cultivated.

"Churrus." This exists as an article of commerce, passing through Lahul on its way to Kulu. It is not much used in Lahul; and although *Cannabis Indica* is very common near villages, Churrus is not made from it, but what is required for consumption is purchased from the traders. The plant itself is called "Bhangee" (Hind.).

Condiments.—No. 74, *Carum carui*, L., grows largely wild. No. 76, *Cuminum cyminum*. The seeds of this, called "Zira," are

a large export article to Kulu, collected from wild plants, never cultivated.

The bulbs of No. 95, *Allium* (unnamed), and No. 96, *Allium cerocephalum*, L., are also exported in some quantity.

Medicines.—Many of the indigenous plants are used in medicine, some with good reason, others again simply because the natives have been in the habit of using them.

As emollient applications to bruises, swollen joints, &c. we have No. 50, *Codonopsis ovata*, Benth.; of this the thick tap-root is the officinal part; of No. 81, *Myricaria elegans*, Royle, the leaves are used.

In fevers they use a decoction of No. 57, *Gentiana tenella*, Fries, besides several other Gentians, the officinal parts being the leaves and stems. The Mission, from the roots of No. 62, *Gentiana decumbens*, L., made a decoction, but had not required to try its efficacy after it was made. The natives throw away the root part, not making any use of it.

The bulbs of No. 152, *Aconitum heterophyllum*, Wall., are largely used and exported to Kullu, chiefly as a febrifuge, called in Lahul "Bonga" (Tib.).

In lung-complaints the jelly made from the fruit of No. 294, *Hippophae rhamnoides*, L., is strongly recommended by the Tibetans, much in the same way, and no doubt for similar reasons, that black-currant jelly is such a popular household remedy in Scotland.

Parts of No. 93, *Podophyllum Emodi*, Wall., No. 121, *Saxifraga ligulata*, Wall., No. 196, *Pedicularis Hookeriana*, Wall., No. 263, *Dolomiæa macrocephala*, DC., and No. 296, *Ephedra Gerardiana*, Wall., are said to be used; but for what diseases or reasons we cannot say. The Rhubarbs are not used medicinally, although the young stalks and leaves are eaten as vegetables. No. 112, *Rheum Emodi*, Wall., "Lachu," would no doubt prove a useful purgative; as, although this plant has been cultivated in the Mission garden as a substitute for European Rhubarb, it does not as yet seem to have lost its purgative property.

Sugar, "Kara," wholly an article of importation, is chiefly used medicinally, no doubt partially to correct the flavour of their coarse drugs. In the houses of the poor it is quite unknown; and not seldom are the missionaries applied to for a little bit of sugar in cases of disease where a European would not think of sugar being able to do any good.

Scent.—The plant of No. 149, *Delphinium Brunonianum*, Royle,

in a fresh state, has a strong odour of musk, indeed so much so that by this peculiar odour the locality of the growing plant may be detected. No. 200, *Pedicularis* (unnamed sp.) is also very frequently similarly scented.

Incense, "*Boi.*"—No. 210, *Morina breviflora*, Edgw. This plant the natives use as incense; by throwing it on the fire it gives forth while burning a very agreeable perfume.

The fruit of No. 283, *Juniperus excelsa*, Bieb., is used very extensively for incense by the "Buddhists." A pious Buddhist will every morning be seen regularly burning his incense on his housetop as a most sacred ceremony; and the incense used consists nearly always of this fruit.

Dyes, "*Tsoi.*"—The roots of several plants are used for the purposes of dyeing, but not by the natives of Lahul themselves. A peripatetic dyer from Kullu, passing through the villages, dyes whatever his customers may wish him. They themselves do not pretend to be possessed of the necessary knowledge required for this purpose. Plants No. 18, *Rubia cordifolia*, L., and No. 109, *Polygonum tortuosum*, Don, both yield a yellow dye.

The clothing of the natives consists nearly entirely of wool, or of prepared sheep-skins ("Luk-lok nyekan"). The men are dressed in grey, and the women in black. No cotton clothing, except by the Hindoos in the Lower valley, is ever used. They are fond of small gay bits of rag to tack on in patches to the outside of their sheepskins, and usually manage to have a patch of red between the shoulders.

Washing.—The natives very rarely indeed ever think of washing either their own persons or their clothes; but notwithstanding this fact of uncleanliness, they do occasionally use certain plants as a substitute for soap, mixed with a natural impure soda called "Bul," obtained from the lake of "Rupshu," in Ladak. Thus, of No. 91, *Polygonatum multiflorum*, Allioni, the root is powdered and mixed with the water used; of No. 134, *Silene viscosa*, Pers., the root and leaves are used, as also in a similar way the root and leaves of No. 309, *Lychnis Indica*, Benth.

Tanning.—Leather, "Kowa," "Koa," is little used in Lahul; and that which is made in it should more correctly be called "prepared skin." The method they employ for preserving skins is the following. To prepare a large skin they first of all spread it out on the flat roof of their house in the sun; they then sit down on it and work the whole skin under their bare heels until it be-

comes of a proper consistency. The smaller skins they carry about with them, working them with their hands at all spare moments, very much in the same system as that followed out by young ladies with their fancy work—but, we must say, make themselves less agreeable companions for the drawing-room. Whilst these skins are under preparation they give forth a most disgusting and unbearable stench. The Lahulees at all times are not sweetly perfumed. On one occasion a Lahulee of some standing in society came to visit Mr. Jaeschke, and, on his entering the room, confounded Mr. J. with the fœtor. The Lahulee, seeing that the stench had been noticed, raised his hands, and showed a small skin he was working at, thus apologizing for what he considered but a slightly disagreeable smell. These prepared skins, in the form of wallets, "Kyalpa," are largely used in their households in place of boxes &c., to hold their goods and chattels. Every native met with travelling has one of these skin bags under his arm, containing his provisions &c. for the journey.

Leather shoes, "Kabsha," (Pers.), made in Kullu are procured by the wealthier Lahulees; the shoes used by the generality of the people are either those made of barley-straw, "Bulla," or of goats-hair, "Babu" (Pers.), thickly felted.

Oils, "*Marnak*."—No plants yielding oil as one of their products are cultivated in Lahul. Oil lights are a luxury scarcely to be met with except in the houses of the wealthy, or, indeed, lights of any kind. If by chance a light be used, it will be found to be one fed by "ghee" (clarified butter), or torches made from the resinous wood of *Pinus excelsa*, Wall.

Oil is, however, extracted from the seeds of No. 51, *Impatiens tingens*, Edgw., a common weed of the valley, but this oil is only used in polishing the cups and wooden vessels that they are so fond of making from the knots of trees.

Fibres.—Although the *Cannabis Indica* and No. 314, *Linum perenne*, L., with a *Desmodium*, are to be found in some quantity, they use the fibre of none in rope-making, all their rope, string, or twine being made from hair ("Takpa") or wool. They know that No. 297, *Cannabis Indica*, yields a material converted by the people of Kullu into rope &c.

Tinder, "*Shrawa*."—From No. 242, *Cousima*, sp. (unnamed), they collect and make their tinder; and we may say that, as "Bryant and May's Patent lucifers" are unknown in these regions, the flint, steel, and tinder are still the sources for obtaining fire.

Paper, "*Shuggu*" *and* "*Kaguz*" (Hind.).—For this they gene-

rally use the bark of No. 280, *Betula Bhojputra*, Wall., called "Drowa" or "Droa," which, as is well known, is a first-rate substitute; but paper can be, and is, occasionally, made in Lahul from a *Desmodium*. The Lahulees are not very literary in their pursuits; and hence it but rarely occurs that there is a run on the paper-market. It is usually made to order, and generally, when it is so, in some quantity. On the last occasion it was made for a Lama wishing to recopy some religious books.

These Desmodiums, we may state, make a very strong rope; their long stems being twisted together are often in this rough state used for making the rope bridges used in Bussahir and Kunwar. Captain Lang, R.E., has often found these ropes very useful in the construction of the Hindostan and Thibet road.

Trees, "*Butra*" (Hind.).—The common tree of Lahul is No. 283, *Juniperus excelsa*, called "Shookpa," and is *the* tree of the country. It begins to be met with in quantity at 9000 feet of elevation, stopping at an elevation of 14,000, where it occurs chiefly as a shrub. A full-grown and unusually large-sized tree will be in height about 30 feet, and in girth about 8 feet; but as the stem increases in height it does not keep in proportion to its girth at base. The main stem of a tree of the above proportions resembles a thin elongated cone. It forms extensive but thin forests; the timber ("Dungma") is not held in great value, from its shortness and being usually crooked and irregular; this does, however, well enough to build walls with for houses, where one layer of stones is followed by a beam of wood, as also in roofing for the smaller houses of the natives. Upon the forests of this tree being attacked by a species of *Viscum*, No. 295, *Arceuthobium oxycedra*, Bieb., called "Shook-sar" = New Juniper, they soon became all but extirpated. The external structure of this *Viscum* most curiously resembles the foliage of the Juniper; and one's first impression is, that this is but the *Viscum album* metamorphosed by its growth on the Juniper.

The most valuable tree, but occurring chiefly, as already mentioned, in two forests, is No. 279, *Pinus excelsa*, with a few individual trees spread over the country. It does not reach an altitude above 13,000 feet. It is called by a Tibetan name, "Somshing" or "Fir-tree." These two forests belong to Government. No trees are allowed to be felled without a government permit. These yield the larger amount of timber used for building with in Lahul, such as beams, rafters, &c. The largest trees shew timber of about 20 feet; the trees themselves do not average 30 feet in height.

Abies Smithiana, "Rai" (Hind.), occurs in the lowest part of the valley towards Chumba in some quantity, but, except at this, the lowest elevation in Lahul, it is not found elsewhere. In Chumba it is a common tree.

The next common and useful tree is No. 284, *Salix*, sp. (not determinable), "Chungna," which occurs largely cultivated round villages. The wood of this tree is not used for timber so much as for other purposes, of which we shall hereafter speak.

There are several other trees, as Nos. 188, *Pyrus Malus*, L.; 191, *Pyrus ursina*, Wall.; 193, *Pyrus Aria*, L.; 281, *Populus balsamifera*, L.; 282, *Populus*, sp. (not determinable); and 285, *Salix viminalis*, L., to be met with; but none of these are sufficiently common or large enough to be considered of value or brought into general use. No. 281, *Populus balsamifera*, and No. 282, *Populus*, sp. (not determinable), are the tallest trees of Lahul, some being fully fifty feet high. They are termed "Yarpa" and "Makal;" but these names are indifferently applied to either tree. No. 193, *Pyrus Aria*, L., is said to be very common in Kunwar.

Firewood, "*Bud-shing*."—The chief source of firewood is No. 283, *Juniperus excelsa*. The large trees of this are not allowed to be felled indiscriminately; only the smaller are open to the public for cutting. Also No. 294, *Hippophae rhamnoides*, L. This often reaches tree-size. Its wood is hard, making the best firewood. Along with the above, the branches of No. 284, *Salix*, sp. (not determinable), and of No. 280, *Betula Bhojputra*, Wall., not unfrequently come into use, and not rarely those of No. 279, *Pinus excelsa*, obtained by stealth.

The Lahulees are, on the whole, very badly off for firing material during winter. This is due greatly to their own laziness (at the proper season for collecting wood they do not do so, and therefore suffer during the winter), also to the fact, partially, that firewood is not plentiful. In addition, therefore, to using wood for fuel, they largely consume cow-dung made up in flat cakes, impressed with the "sign manual" on them, as met with all over India.

Stoves were found very valuable by the mission, from the small quantity of firing-material required under their use.

Charcoal, "*Solwa*," "*Solla*."—Charcoal in Lahul is made only for private consumption by the blacksmiths. It is not to be obtained except as belonging to them, and then in very small quantities. The only wood used in making it is that of No. 294,

Hippophae rhamnoides, L., from its wood being harder than any other obtainable in Lahul.

Utensils.—From the wood of No. 284; *Salix*, species, they make pails and wooden vessels of all sizes, cut out roughly from the block; these vessels are usually heavy, clumsy, and very shapeless.

Fences.—The branches of No. 294, *Hippophae rhamnoides*, L., are very extensively used in forming fences for fields, &c.; the use of hedges is unknown. The above is the only good material, that grows in Lahul, that is capable of preventing the inroads of cattle into the fields.

Superstitions.—The Lahulees have some superstitious notions relative to No. 281, *Populus balsamifera*, L. Of this there is one large tree near Kyelang, at which yearly a children's festival is held. It is considered to be the seat of the "Dewa" (or god) of children, and hence these trees are never cut down.

The plants of No. 244, *Cirsium argyracanthum*, DC., are, when the corn fields are shorn, left standing as amulets to protect the field. Twigs of No. 283, *Juniperus excelsa*, are used by the priests in several religious ceremonies.

Fodder, "*Zaché*."—What with the stacking of the straw of barley, and the profusion of the grasses throughout the summer, there can be scarcely any want of fodder for cattle. Here, again, the indolence of the inhabitants causes them to suffer greatly, as they scarcely ever stack for winter's use a sufficiency for their cattle, trusting entirely to an early spring. A long winter creates great loss amongst the cattle, and the poor starving animals may be seen going about searching vainly for food, turning up the snow with their horns, and eating nearly anything they can find, as the remnants of old straw-shoes, rags, &c., with evident gusto. In the early spring the young shoots and leaves of No. 284, *Salix*, species, are extensively used, and collected for fodder for the cattle chiefly just before the grass begins to spring. But at any time, indeed, the cattle will eat this willow, which, as already stated, is largely cultivated round the villages. The natives store up but little fodder, and that strictly for winter consumption. During autumn, after the crops are removed from the fields, and nearly all grass is dried up, the cattle may be seen moving over the fields searching diligently for anything in the shape of food; and until the snow falls, these poor brutes have to do their best to procure food for themselves. Their owners on no account will give them of the stacked fodder at this time; but immediately

preceding the season of ploughing, they obtain an allowance to fit them for the labour to be undergone.

Thatching.—The houses are all flat-roofed; and these roofs consist of beams, rafters, reeds, or grass, with mud over all. The bark of No. 280, *Betula Bhojputra*, Wall., is not used for roofing-purposes, as it is in Kunwar, where this is one of the chief uses to which it is applied, taking the place of the reeds and grass in the Lahul houses.

The Mission-house is slated. The hills consist very extensively of slate ("Ya-mang"), but the natives, although shown the example, have not in one case followed it.

Exports.—Of vegetable produce exported from Lahul, as commercial articles, we have:—

The seeds of No. 76, *Cuminum Cyminum*, called "Zera," from the wild plant, are largely exported, *viâ* Kullu, to Northern India. The bulbs and dried leaves of No. 95, *Allium*, species, and No. 96, *Allium cerocephalum*, L., are exported in the same direction. The bulbs of No. 152, *Aconitum heterophyllum*, Wall., under the name of "Bonga," *viâ* Kullu, changing their name "*en route*," enter Northern India as "Atees."

Churrus.—A product obtained from No. 297, *Cannabis indica*, is an article of transit: coming from Yarkund, it passes through Lahul and Kullu to Northern India.

Imports.—The chief importations into Lahul of vegetable products are:—

Wheat, largely from Kullu. Wheat-flour is in very common use amongst the generality of the people, eaten in the manner we have already described.

Rice is imported in less quantity than wheat; what is used of it in diet is chiefly so by the Hindoo population.

Tea from Thibet.

Apricots are imported in the form of dry fruit, called "Pating," from Baltee to the west of Ladak, and are used by the wealthier natives.

Apples, "Kushoo," and walnuts, "Darga," rarely, and in small quantities, from Kullu.

Tobacco, in some quantity, from Kullu.

Sugar, in small quantities, from ditto, as also pepper, ginger, turmeric, garlic, and onions, these last, however, chiefly for the use of the wealthy Hindoos.

The province of Lahul exports, but in a very minor degree; and what importations take place are chiefly for the purpose of

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barter for wool. Indeed the country acts more as one of the great highways for India, *viâ* Thibet, to Central Asia—"chiefly due to the suddenly lowered elevation that occurs in the hills that bound it on the south as well as in those that bound it on the north," viz. at the Rotang and Bara-Lacha passes. This highway crossing through Kullu passes over the Rotang Pass, crossing the Chundra river at Koksar by a lately erected bridge, keeps along the northern bank of the Chundra to near its union with the Bhaga river, where, a little above the union of the two rivers, it crosses the Bhaga by a good bridge. It now passes up the western bank of the Bhaga river as far as Patseo; here the road crosses the river by a bridge, the greater part of which is a natural formation from overhanging rocks, a small portion only of it requiring to be finished by art. The eastern side of the valley is now kept until the snow-bridge is reached; across this the road goes in close proximity to the Bara-lacha pass, over which the road goes to the north.

Along this road nearly all the chief villages of Lahul occur; and since the formation of the bridge at Koksar, the road is traversable throughout its whole extent by ponies and mules.

The Flora.—As already stated, the valley of Lahul up to an elevation of nearly 11,000 feet is characterized during summer by its verdure, but above this height by general aridity and barrenness. Thus, out of 282 species furnished by the accompanying collection (of the elevation of the localities of which we have a very fair general idea), we find no less than 56 species especially connected with 8500 feet, 9000 feet, 9500 feet, and 10,000 feet, besides 95 species ranging from 8500 to 10,000 feet, and, in addition to them, 54 species coming down from higher elevations to these lower ones,—that, in short, 205 species out of 282 are to be met with in a region extending over the first 2500 feet of altitude, viz. from 8500 to 11,000 feet, and that 77 species occur only above this height, viz. from 11,000 feet to 16,000, with 54 species common to this as well as the lower elevation. From 10,000 to 15,000 feet inclusive, we find on an average not more than 55 species occurring at every region of 1000 feet.

Thus at 11,000 feet the total number of species collected amounts to 57, at 12,000 feet to 54 species, at 13,000 feet to 51, at 14,000 feet to 56, at 15,000 feet to 48.

We come to a minimum at 16,000 feet, three species only belonging to this height, with five that are common to it as well as to a lower elevation, making only eight in all.

From the above we might divide the vegetation, according to the altitude, into three zones:—the first extending from 8500 to 11,000 feet, and containing the maximum of vegetation; the second zone from 11,000 to 16,000 feet; the third zone from 16,000 feet upwards, containing the minimum of vegetation.

The flora of the valley or first region or zone of vegetation is characterized chiefly by the presence of nearly all the *trees* that exist in Lahul, viz. *Pinus excelsa*, *Abies*, Juniper, Poplars, Willows, *Betula*, *Hippophae*, *Pyrus*—more especially, however, by the Juniper and *Hippophae*, the former of these two being not only very profuse but forming forests (stopping at 14,000 feet, where it occurs as a shrub), and the latter chiefly as a shrub, not unfrequently forming trees, up to an elevation of 14,000 feet. The *Pinus excelsa*, except in the two forests particularly mentioned, is not a common although an occasional tree. The *Salices* come next in abundance, more especially as one of these, No. 284, *Salix*, species, is regularly cultivated, besides the presence of nine others of the same genus growing luxuriantly.

The Poplars by their extreme height overtopping the other trees makes them somewhat characteristic in the landscape. The *Pyri* and *Betulæ* are but few, not very common, the former occurring more usually round villages. The Roses, of which there seem to be no less that nineteen varieties, with No. 294, *Hippophae rhamnoides*, No. 83, *Berberis vulgaris*, L., var. *ætnensis*, No. 195, *Spiræa kamtschatica*, Pall., and *Loniceras*, with *Myricaria*, as a riverside shrub, form the shrubby, bushy vegetation of the valley; this, during the month of July, when the roses are in full blossom, is nowhere to be eclipsed in its beauty; mixed with them we have several of the *Ribes*, as well as No. 50, *Codonopsis ovalifolia*.

The under shrubs and herbs are still more numerous. The finest flowering plant in Lahul is No. 85, *Eremurus spectabilis*, Bieb., of which the flowering stem is fully six feet in height, and the spike of inflorescence from two to three feet in length. The next one is *Hemerocallis fulva*, L., No. 84, a not very common but a most gorgeous-flowered plant, its flowering stem being also nearly six feet in height, bearing numerous flowers, each one having a brilliant orange corolla four inches in depth.

The *Iris kamaonensis*, No. 6, occurring at nearly all heights, characterizes the country by its immense beds of purplish-blue flowers.

The *Anemone* is in great profusion, with the *Ranunculi* and *Caltha palustris*, occurring nearly everywhere, covering the

meadows with their varying-coloured flowers, *Potentilla*, *Sibbaldia*, and no fewer than nine species of *Pedicularis*, besides *Gnaphalia*, *Valeriana*, *Artemisia*, *Epilobium*, *Galium*, *Aconites*, *Delphinium*, *Aquilegia*, &c. *Primulæ* are very common in spring, and Gentians in the summer, with *Androsace*, one of which is one of the commonest flowers in Lahul, as well as *Geranium Wallichianum* (Sweet), No. 317. *Tussilago Farfara* flowers throughout the winter. *Leontodon Taraxacum* is common in the extreme, with several of the Boraginaceæ, &c.; and creeping over many of them we have no less than three kinds of *Cuscuta*.

Characteristic of the second region we have, first of all, an absence of trees, the Juniper, an *Andromdra* and a *Rhododendron* as shrubs. Here the Gentians grow in great luxuriance, with the Rhubarbs and No. 103, *Polygonum affine*, Don. The two latter are not unfrequently to be seen in great masses or beds, covering the ground, becoming in autumn of a deep brick-red colour, producing a striking effect in the landscape. There are yellow and orange-coloured *Potentillæ*, with several of the Saxifrages and one or two of the *Salices* in an Alpine form. Some of the *Primulæ* occur in extensive beds recognizable at a very great distance.

In the third region, viz. at and above 16,000 feet, the most characteristic plant is No. 111, *Rheum moorcroftianum*, Meis., which does not occur below this height.

We have some plants, again, especially characteristic not so much of elevation as of position—such as for instance grow more luxuriantly on the crests of hills, the most exposed, bleak situations, or upon a northern or southern exposure.

Upon the crests of hills, No. 6, *Iris kamaonensis*, Wall., grows in great luxuriance, although it apparently does well enough in more sheltered localities and at low elevations. But Nos. 263, *Dolomiæa macrocephala*, DC., and 264, *Saussurea sorocephala*, Schr., may be regarded as the typical plants occurring on these crests; No. 12, *Hierochloe laxa*, Royle, is met with in similar localities, and is valued as a good grass for fodder, and several of the *Primulæ*—Nos. 24, *P. purpurea*, Royle, 25, *P. elliptica*, Royle, 26, *P. minutissima*, Wall.

Of those that prefer a northern situation, occurring on the northern slopes of the hills, are:—No. 25, *Primula elliptica*, Royle; 27, *Primula denticulata*, Sm.; 30, *Eritricheum elongatum*, DC.; 50, *Codonopsis ovata*, Benth.; 62, *Gentiana decumbens*, L.; 63, *Gentiana*, unnamed sp.; 65, *Swertia*, new sp.; 93, *Podophyllum Emodi*, Wall.; 100, *Epilobium montanum*, L.; *E. roseum*, L.; 101, *Polygonum*

vacciniifolium, Wall.; 114, *Cassiope fastigata*, Don; 143, *Aquilegia vulgaris*, L.; 147, *Anemone polyanthes*, Don; 279, *Pinus excelsa*; 289, *Salix*, sp.; 301, *Ligularia arnicoides*, DC. And confining themselves to the southern slopes more particularly we have Nos. 122, *Saxifraga diversifolia*, Wall., and 145, *Anemone rupicola*, Camb.

The excessive dryness of the atmosphere admits apparently of the presence of only two of the Fern tribe, and these from the valley.

Mosses and Lichen-forms are very rare.

In addition to the above remarks on the vegetation and flora of Lahul, one cannot well finish this paper without making a few remarks on the animals &c. that are made use of by the inhabitants.

Horses, "Ta," are common, used chiefly for riding-purposes. If for carrying loads, they generally belong to the traders.

Donkeys, "Bongwu," are more common than horses, used for conveying loads, and not for riding.

Of Mules, "Driu," "Diu," until lately there have been none; but since the new bridge at Koksar was built, mules belonging to traders pass through the district.

Yaks, "Yak," are not common.

Cows and Oxen, "Ba," "Balang," are common in Lahul generally. These have no humps; but in that portion of the country inhabited by Hindoos the variety possessing a hump is common.

The "Dzo" or hybrid between the Yak and common Cow, is highly esteemed for ploughing and field-purposes, carrying goods, &c., and is tolerably common.

Immense herds of sheep, "Luk," and goats, "Rama," cover the hills, their chief value consisting in their yield of wool, "Bal," which affords clothing to the whole population. Only a comparatively small part of the sheep's wool is exported, especially the black, which is eagerly sought by the people of Kullu, who prefer bartering for wool to selling their honey, fruits, tobacco, &c. "Pushum" ("Lena," Tib.), the small soft hair that is found mixed up with the roots of the wool, is not produced in Lahul at all, but forms a valuable article of the transit trade, which is to some extent carried out by settled inhabitants of Lahul, as well as by the professional Hindustanee traders. Besides the yield of wool, these animals are used for the conveyance of the through traffic.

Goats' hair, "Ral," is much used in making the only ropes the the Lahulees themselves make, as well as shoes.

Milk, "Oma," forms a large part of the Lahulee diet, when it is obtainable; and that of the Goat is the most common. The

Yak cow, "Drino," gives the richest milk and greatest quantity, from which a rich yellow butter is made. The "Dzo" cow is next as to quantity and quality. The common Cow, "Ba," yields the least and poorest milk. The butter obtained from the milk of the two latter is nearly white, and far from the rich quality of the first. Ewe-milk is also used.

Butter, "Mar," "Gya-Mar," is made for household use; and of the butter-milk, "Dharra," the natives are extremely fond, converting it not unfrequently into a fermented beverage, "Tragmo," by mixing it with a sort of leaven made from roasted barley-meal: this is only used during winter; it has not an agreeable taste.

Clarified butter, "Ghee," is chiefly imported from Kullu; it is used only in the houses of the rich.

Curdled milk, "Zho," is used for eating, though not to a great extent.

Cheese the Missionaries never saw, although they have heard of its being used in Ladak.

The flesh, "Sha," of nearly any animal is eaten by the Lahulees; but, as a general rule, they will not kill an animal for the purpose of eating its flesh. But they will eat the carcasses, whether the animals have died from starvation, violence, or sickness. When, however, they are hard pressed for food, or, not having tasted meat for a long time, long for the "flesh-pots," half-a-dozen men will agree to kill an animal in unison, and thus, in accordance with their religious tenets, divide the hideous crime of purposely killing an animal over the community, each man having only to undergo a portion of the punishment that would have otherwise fallen upon one head only.

By their religion they are led to believe that the soul of a man after death enters into the body of some animal; hence their horror of killing animals wilfully.

A servant-girl of M. Jaeschke's was looking on and assisting at the killing of a sheep for the benefit of the mission, when she suddenly burst into tears and said, "Alas! who knows but that this is my poor mother's life we have just taken?"—she having lost her mother but a short time previously.

The flesh of the Cow is eaten on the sly by the Lahulees, so that they may not raise the ireful feelings of their neighbours the Hindoos: they do not eat the flesh of the genus *Equus*.

Of wild animals, the Ibex, "Kyin," is common on the hills; Musk-deer, "Ropotsi," are occasionally to be seen, as also a Lynx, "Shan," and the Wolf; but the last is more rare. A yellow Bear, "Dred," "Ded," is occasionally to be heard of as being seen

in the valley near Chumba. Wild Ducks are known, "Ngurru;" the inhabitants however keep no poultry. Two kinds of the Red-legged Partridge, "Shregpa" or "Chuckore" (Punjabee), are common, as also Blue Pigeons, "Pukron." Bees, "Rangsi-bu," are not known; but honey, "Rangsi," is frequently imported from Kullu, where bees are common.

TABLE I.—*Lahul Plants only.*

Table of the number of Genera and *total* number of Species contained in each Natural Order (expressed by means of a fraction, the upper figure representing the number of Genera, the lower the number of Species).

$\frac{1}{1}$. Tamariscineæ, Linaceæ, Cucurbitaceæ, Loranthaceæ, Oleaceæ, Polemoniaceæ, Chenopodiaceæ, Euphorbiaceæ, Cannabinaceæ, Juglandaceæ, Elæagnaceæ, Betulaceæ, Gnetaceæ, Amaryllidaceæ.

$\frac{1}{2}$. Orobanchaceæ, Juncaceæ.

$\frac{1}{3}$. Valerianaceæ, Convolvulaceæ, Iridaceæ.

$\frac{1}{4}$. Onagraceæ.

$\frac{1}{5}$. Caprifoliaceæ.

$\frac{2}{2}$. Berberidaceæ, Dipsacaceæ, Solanaceæ.

$\frac{2}{3}$. Geraniaceæ.

$\frac{2}{4}$. Papaveraceæ, Crassulaceæ.

$\frac{2}{5}$. Campanulaceæ, Galiaceæ, Cyperaceæ.

$\frac{2}{13}$. Salicaceæ.

$\frac{3}{3}$. Ericaceæ, Coniferæ, Orchidaceæ, Polypodiaceæ.

$\frac{3}{8}$. Primulaceæ.

$\frac{3}{14}$. Polygalaceæ.

$\frac{4}{6}$. Labiatæ.

$\frac{4}{12}$. Saxifragaceæ.

$\frac{4}{13}$. Gentianaceæ.

$\frac{5}{7}$. Cruciferæ.

$\frac{5}{14}$. Scrofulariaceæ.

$\frac{6}{7}$. Gramineæ.

$\frac{6}{10}$. Leguminosæ, Umbelliferæ, Boraginaceæ, Liliaceæ.

$\frac{7}{10}$. Caryophyllaceæ.

$\frac{8}{21}$. Rosaceæ.

$\frac{10}{19}$. Ranunculaceæ.

$\frac{28}{33}$. Compositæ.

TABLE II.—*Plants from Lahul collected by the Rev. Heinrich Jaeschke.*

THALAMIFLORÆ.

RANUNCULACEÆ.

156. Clematis orientalis, *L.*, a Ladak plant.
138*a*. Thalictrum minus, *L.*
138*b*. Thalictrum Chelidonii, *DC.*, its extreme western range.
144. Anemone obtusiloba, *Don*, collected at "Triloknath" beyond the Chumba frontier.
145. Anemone rupicola, *Camb.*
146. Anemone rivularis, *Ham.*
147. Anemone polyantha, *Don.*
148. Anemone obtusiloba, *Don.*
316. Anemone obtusiloba, *Don.* *A. obtusiloba* varies very much in form and colour owing to locality.
139. Ranunculus hirtellus, *Royle.*
140. A small condition of 139.
142. A variety of 139.
141. Ranunculus lætus, *Wall.*, from Kullu.
157. Caltha palustris, *L.*, large var.
154. Isopyrum thalictroides, *L.* This is a rare plant for India.
155. Isopyrum grandiflorum, *Fisch.*
143. Aquilegia vulgaris, *L.*, var. grandiflora
149. Delphinium Brunonianum ?, *Royle.*
150. Delphinium kashmirianum ?, *Royle.*
150*a*. Delphinium kashmirianum, *Royle.*
151. Aconitum Napellus, *L.*, var.
152. Aconitum heterophyllum, *Wall.*
153. Aconitum Napellus, *L.*, var.
137. Actæa spicata, *L.*

BERBERIDACEÆ.

83. Berberis vulgaris, *L.*, var. ætnensis.
93. Podophyllum Emodi, *Wall.* Fruit used in medicine by the natives.

PAPAVERACEÆ.

136. Mecanopsis aculeata, *Royle.*
227. Corydalis ramosa, *Wall.*

228. Corydalis meifolia, *Wall.*

228*a*. Corydalis Goveniana ?, *Wall.*, a young specimen.

CRUCIFERÆ.

224. Parrya, new species *.

220. Draba stenocarpa, *H. f. & T.*

222. Draba alpina, *L.*

222*a*. A variety of 222.

221. Sisymbrium Sophia, *L.*

226. Sisymbrium columnæ, *L.*

225. Thlaspi alpestre, *L.*

218. Chorispora subulosa, *Camb.*

219. Same plant as 218.

223. Same plant as 218.

CAPPARIDACEÆ.

0. Capparis spinosa, *L.* Collected in Nubra by Mr. Heyde.

CARYOPHYLLACEÆ.

113. Dianthus angulatus, *Royle.*

133. Silene inflata, *L.*

134. Silene viscosa, *Pers.*

130. Silene repens, *Patrin.*

131. Same as 130.

310. Lychnis apetala, *L.*

309. Lychnis indica, *Benth.*

125. Cerastium grandiflorum, *Don.*

132. Stellaria petræa, *Bung.*

128. Arenaria Roylea, *Fenzl.*

129. Arenaria festucoides, *Royle.*

124. Gouffeia holosteoides, *Camb.*

TAMARISCINEÆ.

0. Tamarix gallica, *L.* Valley of Shyok river. Heyde collector.

81. Myricaria elegans, *Royle.*

LINEÆ.

314. Linum perenne, *L.* A good plant for this part of the country.

GERANIACEÆ.

317. Geranium Wallichianum, *Sweet.*

51. Impatiens tingens, *Edgw.*

52. Impatiens sulcata, *Wall.* Husks of the seed eaten raw.

* By "unnamed species" is meant that the plant is in the Kew Herbarium, but is as yet unnamed; by "new species" that the plant is new to Kew.

CALYCIFLORÆ (POLYPETALÆ).

Leguminosæ.

0. Thermopsis barbata, *Royle.*
231. Astragalus carinalis, *Benth.*
232. Astragalus rhizanthus, *Royle.*
233. Astragalus chlorostachys, *Lind.*
228. Astragalus multiceps, *Wall.*
229. Astragalus strictus, *Grah.* From Ladak.
235. Hedysarum, new species.
236. Hedysarum, new species. Both 235 and 236 near H. obscurum, *L.*
0. Desmodium. No specimens; but several species are met with in Lahul.
230. Cicer songaricum, *Steph.* The peas of this plant are eaten by the natives.
234. Lathyrus sativus, *L.* A common weed in Lahul, but said to be cultivated in Ladak.

Rosaceæ.

192. Prunus prostrata, *Labil.* Met with but once, near a village, where it may have been introduced. It is said to be common in "Kunwar" and there called "Paltoo."
195. Spiræa kamtschatica, *Pall.*
183. Rubus purpureus, *Bunge.*
0. Fragaria, species; no specimens.
178. Potentilla grandiflora, *L.*
179. Potentilla multifida, *L.*
180. Potentilla argyrophylla, *Wall.*
181. The same plant as 180.
182. Potentilla atrosanguinea, *Don.*
184. Potentilla ambigua, *Jacq.*
185. Potentilla (Sabbaldia) procumbens, *L.*
186. Potentilla Inglisii, *Royle.* An alpine variety of *P. fruticosa*, L., a good plant.
187. Potentilla Salesovii, *Steph.*
177. Potentilla alpestris, *Hall.*
168. Rosa Eglanteria, *L.* Occurs but rarely in the valley of Lahul, usually forming hedges between fields and hence considered once by Major Hay not indigenous to Kullu.
158. Rosa. Nos. 158, 159, 160 to 167, and 169 to 175. The whole of these may be classed under *Rosa macrophylla*, Lind., or *Rosa pimpinellifolia*, L.; indeed the specimens in this collection, of what were supposed by the collector likely to consist of nineteen species, might even lead us to combine the two

above-named species into one, owing to their apparently distinguishing characters being heterogeneously mixed in these specimens.

188. Pyrus Malus, *L.* Fruit size of a small walnut, both bitter and acid to the taste. The natives call it by the same name as the cultivated apple, viz. "kushoo." Within the last seven years the Mission at Lahul have introduced the cultivation of the apple from Ladak. Previously to this, none were grown in Lahul.

189. Pyrus baccata, *Wall.*

191. Pyrus ursina, *Wall.* Called "Wampu-litseo" or Bear-berries, "Wampu" being the name applied to the Yellow Bear—the berries ripening to a colour somewhat near that of the bear.

193. Pyrus Aria, *Ehrh.*

190. Cotoneaster bacillaris, *Wall.*

194. Cotoneaster Nummularia, *Lindl.*

SAXIFRAGEÆ.

117. Saxifraga flagellaris, *Willd.*

118. Saxifraga pallida? *Wall.*

119. Saxifraga odontophylla, *Wall.*

120. Saxifraga granulata, *L.*

121. Saxifraga ligulata, *Wall.*

122. Saxifraga diversifolia, *Wall.*

123. Saxifraga stella-aurea, *H.f. & T.*

82. Parnassia ovata, *Led.*

53. Ribes villosum, *Wall.*

54. Ribes Himaliense, *Decaisne.*

0. Ribes nigrum, *L.* No specimens.

56. Ribes Grossularia, *L.* No specimens.

CRASSULACEÆ.

298. Sedum Rhodiola, *DC.*

299. Sedum Tibeticum, *H.f. & T.*

127. Same plant as 299.

126. Sedum Ewersii, *Led.*

135. Sempervivum acuminatum, *Decaisne.*

ONAGRACEÆ.

99. Epilobium angustifolium, *L.*

100. Epilobium latifolium, *L.* A good plant.

100*a*. Epilobium montanum, *L.*

100*b*. Epilobium roseum, *L.*

CUCURBITACEÆ.

278. Bryonia dioica, *L.* The first time this plant has been found in India.

UMBELLIFERÆ.

78. Bupleurum, new species.
79. Bupleurum longicaule, *Wall.*
80. Bupleurum falcatum, *L.*, var.
80*a*. Bupleurum falcatum, *L.*
74. Carum carui, *L.*
73. Chærophyllum villosum, *Wall.*
75. Chærophyllum, unnamed species.
72. Pleurospermum (Hymenolæna) Candollei, *Wall.*
77. Same plant as 72.
72*a*. Pleurospermum Govaniana, *DC.*
72*b*. Pleurospermum, unnamed species from Ladak.
71. Ferula Asafœtida ? *L.* The whole plant has an intense fetid stench—so much so that it is very disagreeable to carry portions of it as in the ordinary pursuit of collecting plants.
76. Cuminum Cyminum, *L.*

CALYCIFLORÆ (MONOPETALÆ).

GALIACEÆ.

19. Galium serpylloides, *Royle.*
20. Galium verum, *L.*
21. Galium, white-flowered; species not determinable.
22. Galium boreale, *L.*
18. Rubia cordifolia, *L.* Called "Roona."

DIPSACACEÆ.

210. Morina breviflora, *Edgw.*
17. Scabiosa, unnamed species.

VALERIANACEÆ.

9. Valeriana, new species; near *V. tuberosa*, L.
10. Valeriana, unnamed; near *V. dioica*, L.
11. Valeriana Hardwickii, *Wall.*

COMPOSITÆ.

261. Aster Amellus, *L.*
240. Aster altaicus ? *Willd.*
256. Erigeron uniflorus, *L.*
258. Erigeron acris, *L.*
260. Erigeron acris ?, *L.*

259. Erigeron, species. Specimens too imperfect.
262. Erigeron multiradiatus, *A. Gray*.
240*a*. Erigeron. Specimens too imperfect.
265. Conyza andryaloides, *DC.*
237. Inula Helenium, *L.*
270. Inula, new species.
257. Pyrethrum, new species.
301. Pyrethrum, new species; approaches *P. roseum*, Bieb.
304. Artemisia persica ?, *Boiss.*
305. Artemisia scoparia, *W. & K.*
306. Artemisia vulgaris, *L.*
307. Artemisia parviflora, *Roxb.*
308. Artemisia sacrorum, *Led.*
250. Tanacetum tomentosum, *DC.*
255. Antennaria contorta, *DC.*
254. Antennaria chionantha, *DC.*
254*a*. Anaphalis nubigena, *DC.*, var.
253. The same plant as 254*a*.
252. Leontopodium alpinum, *DC.*
301. Ligularia arnicoides, *DC.*
238. Senecio laciniosus, *Wall.*
243. Saussurea albescens, *H. f. & T.*
264. Saussurea sorocephala, *Schr.*
263. Dolomiæa macrocephala, *DC.*
242. Cousinia, unnamed species.
245. Carduus nutans, *L.*
246. Carduus, if not nutans, *L.*, very near it.
244. Cirsium argyracanthum, *DC.*
0. Leontodon Taraxacum, *L.* No specimens.
266. Tragopogon major, *Jacq.*
267. Scorzonera divaricata, *Turcz.*
247. Prenanthes raphanifolia, *DC.*=P. Brunoniana, *Wall.*
249. Melanoseris saxatilis, *Edgw.*
241. Pterotheca nemausensis, *Cars.*
249*a*. Cichorium Intybus, *L.* No specimens.
248. Tussilago Farfara, *L.*
271. Allardia tomentosa, *Decaisne.*
271*a*. Young plant ? of 271.
251. Waldheimia tridactylides, *Kar. et Kir.*
301*a*. Richteria pyrethroides, *Kar. et Kir.*
269. Sœgesbekia orientalis.

Loranthaceæ.

295. Arceuthobium oxycedri, *Bieb.* Not previously collected in India.

Caprifoliaceæ.

41. Lonicera obovata, *Royle.*
42. Lonicera parviflora, *Edgw.*
43. Lonicera discolor, *Lind.*
44. Lonicera asperifolia, *H.f. & T.*
45. Lonicera glauca, *H.f. & T.*

Campanulaceæ.

50. Codonopsis ovata, *Benth.*, called by the Tibetans "Loodoot."
46. Campanula aristata, *Wall.*
47. Campanula colorata, *Wall.*
48. Campanula evolvulacea, *Royle.*
49. Campanula kashmiriana ?, *Royle.* This plant may be only a var. of 48.

COROLLIFLORÆ.

Ericaceæ.

114. Cassiope fastigiata, *Don.*
115. Osmothamnus fragrans, *DC.*=Rhododendron Anthopogon, *Don.*
116. Rhododendron lepidotum, *Wall.* This plant and No. 115, begin to be found as shrubs above where the belt of trees ceases.

Primulaceæ.

339. Anagallis arvensis, *L.*
28. Androsace incisa, *Wall.*
29. Androsace lanuginosa, *Wall.*
23. Primula, new species.
24. Primula purpurea, *Royle.*
25. Primula elliptica, *Royle.*
26. Primula minutissima, *Wall.*
27. Primula denticulata, *Sm.*
31. Cortusa Matthioli, *L.*

Oleaceæ.

1. Syringa Emodi, *Wall.*

Polemoniaceæ.

32. Polemonium cæruleum, *L.*

Gentianaceæ.

0. Gentiana nubigena, *Edgw.*

57. Gentiana tenella, *Froel.*
58. Gentiana Moorcroftiana, *Wall.*
60. Gentiana, unnamed species.
61. Gentiana amarella ?, *L.* If it is this species, it has not been previously found in India. The specimens before us are not such as to determine to a certainty.
62. Gentiana decumbens, *L.*
63. Gentiana, unnamed species.
64. Pleurogyne carinthiaca, *Grise.*
0. Swertia speciosa, *Wall.*
65. Swertia, new species.
59. Ophelia paniculata, *Don.*
66. Ophelia, unnamed species.
67. Ophelia cordata, *Don.*

CONVOLVULACEÆ.

69. Cuscuta reflexa, *Roxb.*
68. Cuscuta reflexa, *Roxb.*, var. grandiflora, *Wall.*
70. Cuscuta planiflora, *Tenore.* No. 69 is usually met with on No. 215, Nepeta, sp. No. 68 is not so common, and usually on a Polygonum. No. 70 grows chiefly on an Artemisia, and is much more common than the others.

BORAGINACEÆ.

40. Macrotomia euchroma, *H.f. & T.*
39. Arnebia hispidissima, *DC.* From Ladak. This is a plant common to the plains of India and the heights of the Himalaya.
30. Eritrichium elongatum ?, *DC.* No fruit to determine.
34. Eritrichium. New species.
35. Eritrichium sericeum, *Royle.*
35*a*. Myosotis sylvatica, *Hoff.*
38. Solenanthus, species.
0. Solenanthus, species. Specimens of both 38 and 0 too young to determine.
38*a*. Cynoglossum anchusoides, *Lind.*
36. Cynoglossum, unnamed species.
37. Asperugo procumbens, *L.*

SOLANACEÆ.

33. Scopolia præalta, *Don.*
304. Solanum nigrum, *L.*

SCROPHULARIACEÆ.

209. Picrorhiza Kurroa, *Royle.*

2. Veronica lanosa, *Royle*.
3. Veronica Beccabunga, *L.*
4. Veronica Anagallis, *L.*
300. Veronica Anagallis, *L.*, var. pusilla.
5. Veronica ciliata, *Fisch.*
211. Leptorhabdos parviflora, *Benth.*
212. Lancea Tibetica, *H. f. & T.*
196. Pedicularis Hookeriana, *Wall.*
197. Pedicularis tenuirostris, *Benth.*
198. Same plant as 197.
199. Pedicularis pectinata, *Wall.*
200. Pedicularis, unnamed species.
201. Pedicularis brevifolia, *Don.*
202. Pedicularis, new species, very near *P. versicolor*, Wall.
203. Pedicularis verticillata, *L.*
204. Pedicularis abrotaniifolia, *Stev.* Ladak.
205. Pedicularis labellata, *Jacq.* Ladak.
206. Pedicularis tubiflora, *Fisch.* Ladak.

OROBANCHACEÆ.

207. Orobanche, new species.
208. Orobanche Epithymum, *DC.* No. 207 grows on an Artemisia, and is known to the natives as being a parasite. 208 only once met with, and then growing on *Thymus*, sp.

LABIATÆ.

0. Thymus, species. No specimens.
214. Mentha Royleana, *Benth.*
217. Origanum normale, *Don.*
213. Nepeta, species.
215. Nepeta, species.
216. Nepeta discolor, *Royle.*

MONOCHLAMYDEÆ.

POLYGONACEÆ.

86. Oxyria reniformis, *Hook.*
111. Rheum Moorcroftianum, *Meisn.*
112. Rheum Emodi, *Wall.* The natives recognize no medicinal quality in this plant, but frequently eat the stems raw, which are agreeably acid to the taste, and refreshing when one is tired. The young leaves and stalks were used by the Mission as a salad. If the natives are unable to recognize its medicinal qualities, it proved to such as had partaken of the salad its right to a place in the Pharmacopœia.

101. Polygonum vacciniifolium, *Wall.*
102. Polygonum affine, *Don.*
103. Same plant as 102.
104. Polygonum sphærocephalum, *Wall.*
105. Polygonum salsuginosum, *Bieb.*=a form of P. aviculare, *L.*
106. Polygonum polystachyum, *Wall.*
107. Polygonum polymorphum, *Led.*
108. Polygonum Persicaria, *L.*
109. Polygonum tortuosum, *Don.*
110. Polygonum viviparum, *L.*
87. Polygonum rumicifolium, *Royle.*
315. Polygonum polyenemoides, *Jam. et Spach.*

CHENOPODIACEÆ.

275. Eurotia ceratoides, *C. A. Mey.*

EUPHORBIACEÆ.

276. Euphorbia Chamæsyce ?, *L.*

CANNABINACEÆ.

0. Cannabis indica, *Lam.* No specimens.

JUGLANDACEÆ.

0. Juglans regia, *L.* No specimens.

ELÆAGNACEÆ.

294. Hippophae rhamnoides, *L.* Called by the Lahulees "Tser-kar," or white thorn; by the Tibetans "Star-bu." The female shrubs of this tree are far more rare than the male shrubs.

SALICACEÆ.

284. Salix, species. "Chungma."
285. Salix viminalis, *L.*
286. Salix, species. No specimens.
287. Salix, species.
288. Salix elegans, *Wall.*
289. Salix, species.
290. Salix, species.
291. Salix (lost).
292. Salix hastata, *L.*
293. Salix flabellaris, *Ander.*
0. Populus alba, *L.* Kunwar.
0. Populus euphratica, *Oliv.*
281. Populus balsamifera, *L.* Cultivated largely, called "Yarpa."
282. Populus, species. Called "Makal."

H 2

Betulaceæ.

280. Betula Bhojputra, *Wall.* "Stagpa."

Gnetaceæ.

296. Ephedra Gerardiana, *Wall.*

Coniferæ.

279. Pinus excelsa, *Wall.* Called "Som-shing."
280*a*. Abies Smithiana, *Loud.*
283. Juniperus excelsa, *Bieb.*

ENDOGENS.

Orchidaceæ.

274. Dienia, species.
272. Orchis maculata, *L.*
273. Herminium Monorchis, *L.*

Amaryllidaceæ.

0. Ixiolirion montanum, *Herb.*

Iridaceæ.

6. Iris kamaonensis, *Wall.*
7. Iris, unnamed species.
8. Iris, species.

Liliaceæ.

89. Gagea elegans, *Wall.*=lutea, *L.*
90. Gagea thesioides, *Fisch.*
88. Lloydea serotina, *Reich.*
84. Hemerocallis fulva, *L.*
94. Allium, unnamed species.
95. Allium, unnamed species.
96. Allium sphærocephalum, *L.*
85. Eremurus spectabilis, *Bieb.*
91. Polygonatum multiflorum, *All.*
92. Polygonatum verticillatum, *All.*

Juncaceæ.

97. Juncus, unnamed species.
98. Juncus scirpoides, *Jacq.*

Cyperaceæ.

277. Carex nivalis, *Boott.*
277*a*. Carex, species.
277*b*. Carex Moorcroftii, *Falc.*

313. Carex stenophylla ?, *Whlbg.*
311. Cyperus aristatus, *Rottb.*

GRAMINEÆ.

15. Gymnothrix flaccida.
12. Hierochloe laxa, *Royle.*
14. Melica ciliata, *L.*, var.
13. Agropyrum semicostatum, *Nees.*
0. Elymus europæus ?, *L.*
312. Rottbœllia, species.
16. Rottbœllia, species.

POLYPODIACEÆ.

0. Polypodium lineare, *Thunb.* Chundra valley above Koksar. M. Heyde, collector.
303. Allosorus crispus, var. Brunonianus.
302. Cystopteris fragilis. This is the common fern of Lahul; 303 is much less so.

Notes on *Myrtaceæ*.

By GEORGE BENTHAM, Esq., F.R.S., Pres. L.S.

[Read April 19, 1866 and December 19, 1867.]

THE Natural Order of Myrtaceæ is one of the most important in tropical and Australian regions. Scarcely yielding to the Conifers of temperate regions in the gigantic size of some of its trees or in the value of the timber they form, the spices and oils it supplies have long been staple articles of trade. Some of the fruits it produces are highly prized; and many species are cultivated for ornament in the plantations of warmer countries as well as in our own conservatories. But, to the botanist, the distinguishing and classifying their numerous species is a task far from giving satisfaction in proportion to the labour it entails. In some cases the uniformity of structure prevailing through hundreds of species is so great as to have induced monographists to take up the most vague and trifling characters even for generic distinction; in others the same characters have been found here clearly to separate large undoubtedly distinct groups, and there to be so mixed up and confounded together in one and the same natural group as to be no longer available for any more than specific distinction. Some, again, of those which, as far as known, appear to be the most constant are rarely supplied by herbarium specimens; and among the

more apparent ones, those the most useful for distinguishing great groups in one of the three great centres of the order, South America, tropical Asia, and Australia, will not always hold good in the others. The consequence is that no general arrangement can be satisfactory, if founded on the species of one only of those regions; and of this description are all those that have been proposed since the 'Prodromus' of DeCandolle. His distribution was very good, considering the scanty materials he then had at his disposal, but has required very great modifications after the large accessions we have since accumulated. This rearrangement has been more or less worked out for each of the three regions in two opposite directions. An enormous multiplication of genera and species has been proposed by O. Berg for the South-American Myrtaceæ, by Blume for those of tropical Asia, by J. C. Schauer for the Australian ones, and by Brongniart and Gris for the smaller group of New Caledonia; whilst reconsolidation has been more or less effected by Grisebach for tropical America, by Wight and A. Gray for tropical Asia, and by F. Mueller for Australia; and, whether disruption or consolidation have been the guiding principle, the characters made use of in such widely spread groups as *Myrtus*, *Eugenia*, and their allies have often been different, according to whether the American, the Asiatic, or the Australian species have been chiefly had in view. All these difficulties which the systematist has to encounter are not a little enhanced by the tedium of examining ovaries and seeds in an Order where their resinous or woody nature often requires much boiling to soften them, and where especially it is so unsafe to conclude upon the structure of one species from the examination of an apparently closely allied one—where in such vast natural and almost uniform genera as *Eugenia*, *Eucalyptus*, and *Melaleuca*, a very few species, and sometimes a single one, may, without any external indication, have a totally exceptional anther, or ovary, or embryo.

Having myself on former occasions examined a large number of American and Asiatic species, and having now been obliged carefully to go through the whole of the Australian ones, as well as many species of the tropical genera which had not previously come under my eye, I have thought it might be worth prefacing my notes on the limits of individual genera by a few remarks on the stability and instability of the several characters observed, which I shall take in the usual systematic order, commencing with the flower and fruit and then passing to the organs of vegetation.

1. Calyx.

The modifications of the calyx in Myrtaceæ have been made great use of by the multipliers of genera, and more or less passed over by the consolidators. Tested by the degree of constancy in groups otherwise natural, the form of the calyx-tube is but rarely available even as a secondary character, whilst that of its limb or lobes is the only one available for the limitation of some universally admitted genera (e. g. *Verticordia*), or the one mainly relied upon in others (e. g. *Psidium*).

The marked distinction in Myrtaceæ and Rosaceæ between the calyx-tube and its limb, *i. e.* the portion below and above the edge of the staminal disk, is so great that many modern botanists, especially Germans, deny that the former is a portion of the calyx at all. They regard it rather as an expansion of the peduncle, or as a separate organ, which they call *hypanthium*, and limit the calyx to the portion above the disk. This they describe in Myrtaceæ as consisting of distinct sepals, or more rarely as a gamosepalous, lobed, toothed, or truncate limb, or as altogether deficient. Those on the other hand who follow the French doctrine of *soudures* or concretion of organs, give the name of *calyx* to the whole of the external layer of floral covering, from the base of the ovary, whether consolidated with the ovary into a single mass or more or less separable from it, designating as *calyx-tube* the hypanthium of the Germans, whether adnate to the ovary or free; the calyx-lobes or segments of the limb correspond to the German sepals, and the toothed or lobed limb to their toothed or lobed calyx. The settling these differences does not now depend so much upon the observation of facts, which are very generally and accurately known, but upon the most logical, or even the most convenient mode of interpreting those facts; and our conclusions must be drawn, not from the modifications presented to us in Myrtaceæ and Rosaceæ alone, but from what we observe also in other allied orders, and from the general principles forming the theory of concretion and distinction of organs; and I trust I may be excused in recalling here some of the axioms, however simple and generally admitted, upon which that theory is founded, as it appears to me that we are often too ready to lose sight of them in the description of special points.

1. Throughout biology, the organs of a living being are not parts separately formed or superadded to each other, as when we build a house or construct a machine; but every organ, as every

individual, grows out of or proceeds from a preexisting one, of which at first it forms a part. And as, in the case of animals as well as plants, it is not always easy to determine the precise moment when the offspring becomes a separate individual, so, before separation, it is as difficult to fix the precise point marking the commencement of each separate organ.

2. In vegetable homology, the perfect phænogamous plant consists of an *axis* and of *appendages*, often called *leaves*, in a theoretical sense—but which it is more convenient to term *leaf organs*, to distinguish this general meaning from that special modification to which more usually the name of *leaf* is restricted. These leaf organs, under all the variations which distinguish the bud-scale, the leaf, the bract, the sepal, the petal, the stamen, and the carpel, yet agree in their general characters as to origin or insertion, development and ultimate separation from the axis. And in all leaf organs we include in the organ the stalk supporting the lamina—the petiole of the leaf, the filament of the stamen, &c.

In considering, therefore, whether the outer cup, which encloses or is adnate to the ovary in Myrtaceæ, should be described as part of the peduncle (*i. e.* of the axis), or as part of the calyx, or as an independent organ—in determining whether the calyx commences at its base or at its apex, we should compare it not only with the corresponding organ in allied Natural Orders, but also with the corresponding portion of other leaf organs.

In the great majority of cases we have no hesitation in fixing the point where the leaf organ commences. Ultimate separation by disarticulation or decay takes place at the point where it diverges from the stem, peduncle, or receptacle, so that in falling off it leaves only a scar or slight protuberance or concavity. But in all leaf organs, whether vegetable or floral, there are exceptions which have not always been uniformly dealt with.

In the leaf the lower portion of the petiole persists as a spine in *Sarcocaulon*, or hook in some species of *Combretum* and *Smilax*; or the whole rhachis in many *Astragali* and other pinnate-leaved plants of dry hot countries forms a persistent spine; or, in other leaf organs, a portion of the base of the corolla-tube in *Nuxia*, *Dampiera*, and others, or of the filaments of the stamens in *Stylobasium*, *Lecostemon*, &c., or of the carpels in circumsciss capsules, remains also persistent after disarticulation of the remainder. In all these cases we uniformly describe these persistent portions as belonging to the leaf organ, not to the axis; the line of demarcation is at the point of divergence, not at the point of disarticulation.

So it is also when several leaf organs of the same whorl are united by a base persistent after the fall of the remainder, as in the case of the stipular sheath in *Spermacoce*, *Hedyotis*, and some other Rubiaceæ, the persistent united portion of many monadelphous stamens, the hardened persistent base of the filaments in *Melaleuca angustifolia* and many other Myrtaceæ, the persistent base of the corolla in *Nuxia*, the persistent base of the circumsciss capsules of *Sesuvium* and its allies, many Primulaceæ, &c., all of which are universally admitted to be portions of the leaf organs, not of the axis.

It is objected, however, that the case of the so-called calyx-tube of Myrtaceæ and Rosaceæ is very different, inasmuch as more or less of the inner whorls of organs are inserted upon it, and that, as it bears these organs, it must be a hollow prolongation of the axis, not part of a leaf organ. This appears to me to be purely a reversion to the old way of viewing structure before the introduction of the theory of consolidation of organs, which, if retained in the case of the calyx, ought surely to be equally taken into consideration in that of the corolla and other leaf organs.

Leaves are not usually so closely superposed as floral organs, and no instance of consolidation of those of two superposed whorls occurs to me; but they are occasionally concrete at the base with the axillary peduncle. Thus in several Chailletiaceæ, where the flowers were formerly considered to be inserted on the petiole, it is now recognized that the base of the peduncle and the base of the petiole are concrete, and both are supposed to commence from the point of divergence from the stem. So the bracts of Marcgravieæ, of *Tilia*, &c., apparently inserted on the pedicels, are admitted to be subtending bracts with their petioles concrete with the pedicels.

Taking next the leaf organs above or within the calyx, we have much more frequent instances of the concretion of two superposed whorls, closely analogous to that of the calyx, corolla, and andrœcium in Myrtaceæ. Thus in almost all the Monopetalæ (or gamopetalous flowers) the corolla and andrœcium are so much connected at the base that for convenience' sake we describe the stamens as inserted in the tube of the corolla; but at the same time we all admit that both stamens and petals are really hypogynous but concrete at the base, that both commence from the point of divergence from the receptacle; and no one, to my knowledge, has ever proposed that the corolla-tube up to the divergence of the stamens should be considered a part of the receptacle or axis. So also in cases of concretion of the andrœcium and gy-

næcium, as in *Aristolochia, Saururus, Chloranthus*, &c., the stamens, although described for convenience as inserted on the ovarium, are admitted to be really adnate to them.

It has been supposed that the union of the inner organs with the calyx-tube in Myrtaceæ and their allies, if it exists theoretically, is too complete for their hypothetical distinctness to be more than imaginary, whilst in gamopetolous corollas the filaments can be traced to the base. But that is far from being always the case. In numberless Corollifloræ the bundles of vessels descending from the filaments are absolutely undistinguishable from the veins of the petals; and the cases are comparatively few where the prominent ribs lining the corolla evidently connect the filament with the receptacle. There are, on the other hand, calycifloroue plants, among Lythrarieæ, Rhamneæ, Samydaceæ (Homalineæ), &c., in which the union of the stamens at least, or even of the petals also, with the calyx becomes gradually less complete and is traceable to the base.

Again, it may be said that in all cases of concretion of the inner whorls of floral organs it is only two such whorls that are united —the corolla with the andrœcium, or the andrœcium with the gynæcium; whereas in many Myrtaceæ we are obliged to suppose the concretion of all the floral whorls into one fleshy mass, showing no more trace of a compound nature than the peduncle below it till the organs separate at the summit, and that this structure is much more rationally explained by supposing it to be really what it appears to be, a hollow receptacle or enclosed summit of the peduncle bearing on its margin or inner surface the various organs. But this argument would seem in the first place to carry us to conclusions not only beyond what the advocates of the theory have come to, but in opposition to some which are universally admitted in the homology of Phanerogams, and in the next place to be quite untenable when applied to closely allied plants in the same or in allied Orders.

First, then, if we deny that this cup is a concretion of the base of the floral organs, we cannot fairly make an exception as to the carpels, of which there is no more evidence than there is of the base of the stamens or petals; and we must suppose that the ovule-bearing placentas proceed from a central axis without the intervention of any carpellary leaves, which, like the stamens, petals, and sepals, are inserted at the orifice of the cup. Even this theory has, indeed, been broached by Schleiden, Schychowsky, and some others; but I believe it to be now generally abandoned by most even of those who maintain the peduncular nature of the Myrtaceous and Rosaceous cup.

Secondly, it would, I think, be no difficult matter to trace the gradual disconnexion of the various whorls through nearly allied plants of these and adjoining orders. In many Myrtaceæ where the union at first appears the most perfect, a vertical section will show three more or less distinct layers—the ovary inside, surrounded by the staminal disk, to which I shall presently revert, and the calyx-tube outside. In a few capsular Myrtaceæ, and in many Melastomaceæ, the connexion of the ovary is imperfect, or only along the midribs of the carpellary leaves. In many capsular Myrtaceæ the ovary, especially when the flowering is past, detaches itself in drying. In some dried specimens of *Eucalypti*, I have found the three layers (calyx-tube, staminal disk, and ovary) quite detached from each other by desiccation. In a few species of *Bæckea*, *Tristania*, *Xanthostemum*, &c., as in a large number of Melastomaceæ, the ovary is quite free although closely enclosed in the cup, and in all cases the insertion of the gynæcium is within the cup at its base. Even in those few apocarpous genera (such as *Rosa*, several species of *Bauhinia*, and some other Cæsalpinieæ) where the carpels appear to be inserted on the sides of the cup, their stalks proceed from its base, and are evidently adnate only to the sides, where they form so many prominent ribs.

It is in Lythrarieæ especially that we can observe the gradual liberation of the stamens from the cup. Almost throughout the Order they are inserted at various heights below the petals, sometimes quite at its base, often below the middle; and the filaments below the apparent insertion are either blended with the substance of the cup or are more or less distinct as veins or prominent ribs. The petals in the same Order almost always appear inserted on the margin of the cup between the calyx-lobes; the cup or calyx-tube then becomes strictly analogous to the corolla-tube of those gamopetalous flowers in which the stamens alternate with the corolla-lobes at the orifice of the tube.

In Goodenovieæ we can equally well trace the gradual liberation of the corolla-tube from the cup or calyx-tube on the one hand and from the ovary and andrœcium on the other. In *Scævola* and *Dampiera* they are all closely adnate to the ovary in one mass, and immediately above the ovary all are free from each other; in some species, however, as in a few Myrtaceæ, the ovary, especially when the flowering is past, detaches itself in drying. In *Goodenia* the summit of the ovary is more or less free, according to the species, the base of the corolla-tube is adnate to the lower portion of the ovary—the remainder of the corolla on falling off with the

stamens leaving a circular star below the top, and sometimes as low as the middle of the capsule. In this genus the calyx-tube is always wholly adnate, but it is sometimes very much shorter than the adnate part of the corolla; in those cases the calyx-lobes are usually adnate also, but not so high up as the corolla-tube. In *Velleia* the whole calyx, whether campanulate and lobed (as in *V. trinervis*), or consisting of distinct sepals, is wholly free, whilst the corolla-tube is adnate nearly or quite to the summit of the ovary. In *Brunonia* the calyx-tube, corolla-tube, and stamens are all entirely free from each other, but so contracted over the ovary as completely to enclose and give it as much an inferior aspect as in *Scævola* and *Dampiera*.

The argument derived from the leaf-like nature of the deciduous calyx-lobes in *Rosa* as compared with that of the cup or calyx-tube, and the usual disarticulation of the lobes from the persistent cup in the allied orders, appears to me to be a very weak one. Similar foliaceous calyx-lobes are not uncommon in gamopetalous Orders (e. g. *Pedicularis*). Disarticulation of the calyx-lobes, though frequent, is anything but universal in Myrtaceæ and Rosaceæ; and in some genera, such as *Prunus* in Rosaceæ, and some species of *Calythrix* in Myrtaceæ, the disarticulation takes place below the insertion (or divergence) of the petals and stamens, in the middle or near the base of the cup or so-called hypanthium.

It has been said that the organogenesis of the flower in Rosaceæ will show that the cup is an after-production of the peduncle after the sepals have been formed. For, it is stated, in the very young bud the sepals form five distinct protuberances round the margin of the concave summit of the peduncle, the carpels occupying the centre of the cavity; the petals and stamens are then gradually produced between the two; and in after-growth a tissue, gradually formed from the receptacle, raises the sepals to a distance from the axis, constitutes the staminal disk, and, in *Pyrus*, envelops the carpels themselves. This is, however, strictly analogous to the formation of the stalks or supports of other leaf-organs, whether single or combined in whorls. The compound leaf of Leguminosæ and other Orders (always excepting Meliaceæ) has every future leaflet defined at a very early stage, forming a cluster variously folded and almost sessile on the stem, but which in the course of growth is gradually raised to a distance from it by the gradual production of the common petiole (proceeding quite as much from the stem as the calyx-tube does from the receptacle);

and yet this petiole is always considered part of the leaf. So, again, in the staminal tube of monadelphous Leguminosæ, at an early stage the stamens are usually all quite free and distinct in a circle round the pistil, and they afterwards become monadelphous, not by the union of any portion once free, but by the growth of a ring or tube under them, raising them above the receptacle; yet I do not believe that any one would propose to describe the staminal tube of monadelphous Leguminosæ as part of the receptacle and not of the stamens. It is from inattention to this mode of formation that some monadelphous Leguminosæ examined in young bud have not been recognized, but published as new genera with free stamens, such, for instance, as *Marquartia*, Vog., and *Bartlingia*, Brongn.

There only remains to consider whether, as a matter of convenience, it may not be better to adopt the name of hypanthium for the united base of the calyx and corolla (or support of the sepals and petals), as we give that of disk to what may be considered an analogous support to the petals and stamens in Discifloræ and Calycifloræ. Considerable confusion of ideas results from calling by different names in different Orders organs which to all appearance are the same, unless it be clearly shown that they are not homologous; and if the various modifications of the calyx in a series commencing with Scrophularineæ, and passing through Lythrarieæ, Melastomaceæ, Myrtaceæ, and Rosaceæ be compared, it will be very difficult to mark the point where the calyx-tube ceases and the hypanthium commences. The name calyx-tube is correct also if the theory of concretion be adopted, whilst that of hypanthium is not strictly so even on the theory of its being an expansion of the peduncle; it means "what is under the flower," whilst the gynæcium always, and in many Lythrarieæ the andrœcium also, are within it at the base. It will, moreover, be observed that the characters supplied by this calyx-tube are those of external form and indumentum, in which their analogy with similar parts of other Orders is more essential than their theoretical homology.

Before quitting the subject of the terminology of the parts of the flower, I would add a few words on the *disk*, which may be supposed in some points to be analogous to the proposed hypanthium, but of which the theoretical homology is far more doubtful; and the modifications of its form and position supply characters so important that it is very useful to have a name for it quite independent of all hypothesis. Theoretically it may be considered either an expansion of the summit of the peduncle, *i. e.* of the

receptacle or *torus*, or the concrete base of the corolla and andrœcium; its appearance is more frequently that of the former than of the latter, but its consistence is generally different from both. It does not exist in all plants, and, as far as we know, has no definite function to perform in the floral economy. It can scarcely therefore be called a distinct organ; and we describe it rather as a part of the flower generally, leaving it an open question as to whether it belongs to the axis or to the appendages. When it exists it extends from the calyx to the gynæcium, is often more or less adnate to the one or to the other, or to both, sometimes lining the calyx-tube by a thin layer more or less thickened at the margin, and there bearing the petals and stamens, sometimes closely adnate to and covering the ovary with a thin layer thickened at the top, round the style, into the so-called epigynous disk of Rubiaceæ and allied Orders, and then blended often with the thickened summit of the ovary or base of the style. Sometimes it expands into glands or filament-like appendages, or into an annular cup between the stamens and the style, or more rarely between the petals and stamens, still more rarely outside the petals. These appendages are sometimes definite in number, and even symmetrical with other parts of the flower, but they do not, as far as I am aware, assume the appearance of a real whorl of floral leaves; and all descriptions of the disk, whether it be called staminal, hypogynous, perigynous, or epigynous, must be considered to be descriptions of apparent forms, independent of all theories.

It must be observed also that, notwithstanding the adoption of the theory of concretion of organs, it is much the practice, for convenience' sake, to describe one organ as inserted upon the other,—to which there is perhaps no objection if it be perfectly understood that the description is of apparent, not theoretical insertion. And it is usual to describe the least prominent organ of the two as inserted on the most prominent, or, in the case of floral whorls, those of the least concrete whorl as inserted on the more concrete: thus in Chailletiaceæ, the inflorescence is usually described as inserted on the petiole; in *Tilia*, on the contrary, the bract is said to be inserted on or attached to the pedicel. In most Myrtaceæ the calyx-tube or its lower portion is described as adnate to the ovary, the disk, on the contrary, as adnate to or lining the upper part of the calyx-tube. In Calycantheæ again, and in some Nymphæaceæ, &c., the sepals are adnate to or inserted on what may be called either an enlarged receptacle or the petaline and staminal disk, whilst in Lythrarieæ and others the petals and stamens are adnate to, or in-

serted on, the calyx-tube. So in most Monopetalæ the stamens are said to be inserted on the corolla-tube, whilst in Malvaceæ it is the petals that are adnate to, or inserted on, the staminal tube. The concretion in all these cases is theoretically the same, the diversity of expression being regulated by the difference in proportion of the connate organs.

There is another point in the terminology of the parts of the calyx in Myrtaceæ which requires some fixation; that is, as to what is tube and what is limb—often a very vague distinction, variously interpreted by different botanists. It is usually determined by outward form. Where a calyx or corolla is salver-shaped (hypocrateriform), or simply funnel-shaped (infundibuliform), there is no difficulty, the limb and tube are well defined; in the campanulate corolla or calyx the undivided part is called tube, and the limb restricted to the lobe: but the difficulty lies in those calyxes and corollas approaching to the funnel-shape, which have a narrow tube at the base, then a dilated portion which is still further expanded at the top; here the intermediate portion is by some described as part of the tube, by others as part of the limb, and by others, again, as a separate part called *fauces* or *throat*—a difference of view which renders descriptions of the same corolla by some French and German botanists apparently irreconcilable. In many flowers the expansion from the tubular base through the fauces to the horizontal lobes is so gradual that we can only draw a line at the point of division. In the calyx of Myrtaceæ, however, it has been found better to neglect outward form in this respect, and to take as the line of demarcation between the tube and the limb that of the margin of the adnate staminal disk, which I have above alluded to as constantly distinct,—calling all limb that is above that line, whether entire, lobed, or divided to the base.

The degree of development of the calyx-tube above the ovary (whether the stamen-bearing margin of the disk is close to the ovary, or forms a ring more or less perceptibly or prominently raised above it) has been made great use of for the distinction of genera by O. Berg. It has appeared to me, however, not only to be in most cases purely artificial (that is, unaccompanied by any other character or difference of habit), but frequently inappreciable. Take, for instance, Berg's genus *Aulomyrcia* as distinguished from *Myrcia*, or Blume's *Microjambosa* as separated from the genus or section *Jambosa*: by this character alone not only does each of these segregrated genera include groups of species more nearly allied to corresponding groups in the parent genus than they are to each

other, but there are numerous species where it is difficult to say whether the calyx-tube is or is not to be characterized as produced above the ovary. In capsular Myrtaceæ there are many genera where this development of the tube above the ovary is constant, or nearly so; but I have never found it a safe character to rely upon in species not showing other more essential ones.

The degree of development of the entire portion of the calyx-limb, when the lobes do not reach the disk, is seldom of much importance, although useful in aiding in the discrimination of *Psidium* and other genera of Eumyrteæ, so very deficient in positive characters. It always, however, requires careful attention; for where this part is much developed in the young bud, it is apt to split before expanding, so as to give an erroneous idea of the æstivation of the calyx-lobes. In all Myrtaceæ, except a few genera of the anomalous tribe Lecythideæ, and the still more anomalous genus *Fœtidia*, the æstivation of the real calyx-lobes is, as far as I have observed, always imbricate, or at least not valvate; and, with the above exceptions, it forms an important element in the separation of Myrtaceæ from Lythrarieæ. In *Psidium* and its allies, as in some species of *Bauhinia* and allied Leguminosæ, the real imbricate lobes of the calyx are often so small as to elude observation, or are quite abortive, and the entire part of the limb bursts more or less regularly, so as to have caused the æstivation to be erroneously described as valvate. In other genera the lobes are also occasionally so small, and separated in the full-grown bud by so wide a sinus, that it requires the examination of a very young bud to detect their overlapping. In some, however, the valvate character has been attributed to them, even in the works of distinguished botanists, from mere inadvertence.

The form of the calyx-lobes, which we should *à priori* place low in the scale of importance among generic characters, takes nevertheless a much higher degree in some Myrtaceæ. This is especially the case in the tribe Chamælaucieæ, where it is the most prominent character of two of the most natural and largest genera, *Verticordia* and *Calythrix*, prevailing over the usually more essential ones derived from the anthers.

There are a few Chamælaucieæ (two species of *Darwinia*, *Micromyrtus elobata*, &c.) where the calyx-limb is so minute or even entirely undeveloped, and the petals so apparently continuous with the calyx-tube, that the perianth has been described as simple (one of the causes of the non-recognition of the old genus *Darwinia*). A careful search will, however, generally disclose either micro-

scopic teeth alternating with the petals, or a slightly prominent annular ring. In some species of *Eugenia* (sect. *Syzygium*) and a few other Myrteæ, where the calyx-limb is reduced to a truncate line, the difference of consistence readily separates the corolla from the calyx-tube. This character, however, never appears to be of more than specific value.

The consolidation of the calyx-lobes into a calyptra or operculum, circumsciss at the base, and falling off in a mass, as in *Calyptranthus* and *Acicalyptus*, proves to be a better generic character than a similar consolidation of the petals, which in *Eugenia* is but a vague sectional distinction, and often not constant in species. The peculiarities of the operculum of *Eucalyptus*, whether calycine or corolline, will be better reserved for the special observations on that genus.

A duplication of the number of calyx-lobes occurs in some species of *Verticordia*, in *Pileanthus*, and in *Osbornia*. In the former case, the accessory lobes, different from the normal ones, are evidently a prolongation of the joint nerve produced by the union of the two lateral nerves of two adjoining sepals, as in many Lythrarieæ, Labiatæ, &c., and are in this instance of no generic value. In the other two genera the 10 or 8 lobes are all precisely alike in shape, size, and position, and yet the alternate ones ought perhaps to be regarded as accessory. In *Osbornia*, the petals being deficient, we might have supposed that one half of the apparent calyx-lobes were in fact petals; but there is nothing in æstivation, position, or appearance to justify such an hypothesis; and in *Pileanthus* the normal number of petals and stamens are present notwithstanding the duplication of the calyx-lobes.

2. Corolla.

The petals supply very few good generic characters. They are sometimes wanting; but this is usually in exceptional species or in monotypic genera. They are always imbricate in æstivation, and often very much so, the external one completely enclosing the others in the bud. Their form is often much varied, especially in *Verticordia*; but the differences are not even sectional. In general in the Order they are broad, contracted at the base, or very shortly unguiculate, without the long claws and crumpled laminæ of most Lythrarieæ. In a few species of *Darwinia* and some other Chamælaucieæ, where the calyx-lobes are much reduced or obsolete, the petals are attached by a broad base, and in the bud appear to be continuous with the calyx-tube; and this charac-

ter becomes a constant generic one in *Angophora* and *Eucalyptus*. Sometimes they are so coherent in the bud as to fall off at the time of flowering in a single mass instead of expanding. A large group of Old-World *Eugenias* has often on this account been generically distinguished; but so many species have shown a gradual passage from a tardy or uncertain separation to a permanent cohesion, that most botanists have now given up *Syzygium* as a genus. In *Eucalyptus* the consolidation is so absolute that it is only by analogy with *Angophora* that we infer the origin of the operculum.

3. Andrœcium.

The stamens, as in some other large Orders, supply, in some cases, many of the best generic characters, whilst in others the same modifications can only be taken as specific or, at most, sectional.

Their insertion is always close to that of the petals, the disk, whether thin and lining the calyx-tube or more or less thickened, being always developed between the stamens and gynæcium, not between the stamens and petals as in most Lythrarieæ, where, in other words, the stamens are usually inserted on the calyx-tube much below the petals. Where the stamens in Myrtaceæ are in one or two rows, they are on the margin of the disk; where there are many rows, they cover the surface of the disk in a ring spreading from the margin more or less towards the centre, but always leaving a clear space in the centre round the style, this clear space being thin or thick, concave or convex, or projecting in a ring at some distance from or close round the style. Sometimes the margin of the staminal disk, or united portion of the andrœcium, projects beyond the insertion of the petals in the form of a single ring or short tube, or of a one-sided appendage, or of five regular appendages alternating with or opposite to the petals, bearing the filaments on their margin or inner face—always quitting the calyx-tube at the same point as the petals, which remain free from the projection, or, when it is annular, are more or less adnate to it at the base. Without always supplying positive generic characters, these modifications are most of them very useful. The annular union of the base of the stamens is general in most Euchamælaucieæ, it is one of the chief characters of *Hypocalymma*, and occurs here and there in other Leptospermeæ, as well as in some Barringtonieæ, without being of much more than specific importance. The projection of the margin of the staminal disk into a

single unilateral stamen-bearing appendage, as in several Lecythideæ, or into as many regular stamen-bearing appendages (or claws of staminal bundles) as there are petals or calyx-lobes, as in *Melaleuca* and other polyadelphous Leptospermeæ, is in most cases taken as an absolute generic character, being constant in a very large number of species otherwise allied. In *Astartea* these staminal bundles are opposite to the calyx-lobes, or alternate with the petals; in *Melaleuca* and its allies they are, on the contrary, opposite to the petals—a difference more important than the actual prominence or non-prominence of the disk (polyadelphy or freedom of the stamens); for the former distinction, or a tendency towards it, when it exists, generally separates the natural subtribe Bæckeeæ from the other Leptospermeæ, whilst the passage from the union of the stamens in phalanges or bundles to their more or less conspicuous juxtaposition in clusters, and thence to the regular uninterrupted ring, is sometimes gradual. This polyadelphy or freedom separates *Astartea* very artificially from *Bæckea*; it is quite constant in *Lamarckea*, *Conothamnus*, *Beaufortia*, *Regelia*, and *Calothamnus*, nearly constant in separating the large genus *Melaleuca* from *Callistemon*, but becomes vague or specific only in *Phymatocarpus*, *Eremæa*, and *Eucalyptus* (*Eudesmia*), and scarcely constant in *Tristania*.

In point of numbers of stamens, the general character of Myrtaceæ as compared with Melastomaceæ is their indefiniteness; and this is perhaps quite constant in Myrteæ and Lecythideæ, even where, as in *Myrrhinium*, their total number is usually below that of twice the petals; it is also constant in most genera of Leptospermeæ, and in *Calythrix*, *Lhotzkya*, and *Homalocarpus* among Chamælaucieæ. In the remaining Chamælaucieæ the number is as constantly definite, twice or four times that of the petals; whilst in the very natural genera *Scholtzia* and *Bæckea* the character entirely breaks down: constant in species, it barely serves to make artificial sections.

The inflection of the stamens in the bud is a very general character, not only in Myrtaceæ, but in Melastomaceæ and other allied Orders, but it is not quite constant. O. Berg found them erect from the first in a Brazilian shrub allied to *Psidium*, which he not only established as a genus under the name of *Feijoa*, but raised to the rank of a distinct tribe of Myrtaceæ, believing it to be also exceptional in the presence of albumen. We have retained it as a genus, as there appear to be other minor points of distinction; but the stamens erect in the bud appear occasionally

also in other genera, as, for instance, in a few species of *Eucalyptus* allied to *E. cornutus*.

In those Chamælaucieæ which have uniseriate stamens, normally four times as many as the petals, the perfection of the whole, the reduction of the alternate ones to staminodia, or the complete disappearance of the latter, are fair generic distinctions. In *Thryptomene* and *Micromyrtus* there are no staminodia; in both, the stamens are either equal to or twice the number of the petals; but when reduced to the simple number they are in the one case opposite to, in the other alternate with the petals—a remarkable difference in genera otherwise so closely allied. In the other tribes of Myrtaceæ, the presence of staminodia or of abnormal stamens is rare, and when it occurs, although a useful auxiliary, is scarcely an absolute generic character. The very remarkable stamens and staminodia of *Napoleona* and *Asteranthos* will be referred to under those genera.

The anthers in Myrtaceæ are, generally speaking, versatile, with two parallel cells opening longitudinally, whilst in Melastomaceæ they generally open only in terminal pores, one to each cell, or the two continued in a single terminal tube. But in both Orders there are exceptions. In Myrtaceæ these exceptions are sometimes generic, sometimes sectional or specific only. The peculiar anthers of *Beaufortia*, *Regelia*, *Phymatocarpus*, *Calothamnus*, *Eremæa*, and *Gustavia* define genera separated also by other characters. So also the biporose and birimose anthers afford a good distinction between *Darwinia* and *Chamælaucium*, whilst the same character becomes sectional only in *Verticordia*; and in the great genera *Bæckea* and *Eucalyptus*, the passage from the one to the other is, in many cases, so gradual as to be scarcely available as a positive specific character. The vast genus *Eugenia*, amidst hundreds of species with the greatest uniformity in the structure of the anthers, presents, as far as known, only one single exception: the anthers of *E. Smithii* are divaricate instead of parallel—one of the very few characters to distinguish this species from the closely allied *E. Ventenatii*. The appendages to the anthers of some species have sometimes, as in *Chrysorrhoe*, Lindl., been proposed as a generic character, which has entirely broken down on further investigation.

4. Gynæcium.

The perfectly inferior ovary (that is, its being adnate to the calyx-tube up to the margin of its flat, concave, or convex summit)

is the general character of the Order; but there are a few exceptions, and, as in some other Orders, such as Rubiaceæ, Campanulaceæ, &c., where this character is important from its all but universality, these few exceptions are specific only, not generic. It is as impossible to found definite groups on the greater or less degree of adherence of the ovary in *Bæckea*, *Hypocalymma*, *Leptospermum*, *Melaleuca*, *Beaufortia*, *Calothamnus*, *Tristania*, *Cloezia*, *Metrosideros*, *Xanthostemon*, *Couroupita* or *Lecythis*, as it is in *Hedyotis* or *Lobelia*.

The number of parts or carpels of the gynæcium was in former days considered of much importance in the distinction of genera, and, although now found to be often very variable, in Myrtaceæ is still occasionally available for that purpose. There are, for instance, large genera (such as *Myrtus*, *Myrcia*, and *Eugenia*) where the number is, with very few exceptions, two or three, and others (such as *Campomanesia*, *Psidium*, *Calycolpus*, *Decaspermum*, &c.) where that number is very rarely below four or five; and the whole tribe of Chamælaucieæ is still more constantly circumscribed by the monocarpellary gynæcium: but even this is not quite definite; there is a passage from *Thryptomene* to *Scholtzia*, which makes it sometimes uncertain whether we have one 2-ovulate, or two 1-ovulate carpels.

The modifications of the style are few, relating chiefly to its length and the degree of dilatation of the stigma, and are specific only, or scarcely even so much.

There is very frequently a thickening of the disk within its stamen-bearing margin round the base of the style. In some Barringtonieæ it forms a prominent ring, or short cup, about halfway between the staminal margin and the central style; more frequently it is thick at the staminal margin, and gradually attenuate to the centre, making a concave summit to the ovary; or, in a great many Leptospermeæ, it is thick all over, and pulvinate, leaving only a very narrow tubular cavity round the style. In several of those species of *Calythrix* and *Bæckea* in which the calyx-tube, lined by the thin disk, is produced far above the ovary, and the staminal margin is thickened round the style, this thickened margin has been mistaken for the summit of the ovary, which has been described as not completely closed, but pierced through for the passage of the free style. This, for instance, was one the chief characters on which the genus *Babingtonia* was founded. A careful examination, however, of species has persuaded me that these modifications of the epigynous disk in Myrtaceæ, as in Umbel-

liferæ, Cornaceæ, and Rubiaceæ, although constant in species, is seldom, if ever, available for generic distinction.

The number of ovules in each cell of the ovary is useful to attend to only where there are one, two, or few, as it is otherwise variable, even in species; but placentation and the mode of insertion of the ovules is, within certain limits, and especially in the capsular tribes, one of the most constant generic characters in the Order, and only recently much attended to. It exercises some patience in its investigation, but it well repays the trouble, and has the advantage of being supplied by most herbarium specimens. As a general rule the character of the order is to have anatropous, or more or less amphitropous ovules, attached in two or more rows to an axile placenta; but the minor modifications are innumerable. The placenta itself is attached to the middle of the axis, or adnate to nearly its whole length, or arises from near or from quite the base, or descends from the upper angle of the cell. In many (if not in all) Chamælaucieæ, the 1-celled ovary being probably monocarpellary, the placenta is more or less approximate or adnate to one side of the cavity.

Osbornia and *Rhodamnia* become 1-celled from the non-development of the placenta-bearing dissepiments; and the placentas are almost basal in *Osbornia*, parietal in *Rhodamnia*. The ovules, more or less curved, or nearly straight, and more or less amphitropous in the great majority of Myrteæ, as in many genera of Leptospermeæ and Lecythideæ, become nearly anatropous and descending (unless when closely packed) in *Leptospermum*, *Kunzea*, *Tristania*, *Backhousia*, and *Grias*, ascending (unless when closely packed) in *Melaleuca*, *Agonis*, *Phymatocarpus*, *Calothamnus*, *Eremæa*, *Syncarpus*, *Lysicarpus*, *Cloezia*, *Tepualia*, and *Couratari*. The laterally attached ovules are usually superposed in two or rarely four vertical rows, which are parallel when the placenta is narrow; but in *Bæckea* and some allied genera the placenta is sometimes dilated, assumes more or less of a peltate form, and the two rows of ovules form a regular ring round its margin, and in *Xanthostemon* (*Fremya*, Brongn. and Gris) the placenta elongates with the ring of ovules below its apex. Where the ovules are anatropous or nearly so, as well as in a few genera where they are very numerous, although more or less amphitropous, they often occupy the whole surface of the placenta without forming distinct rows. In these cases, when closely packed, they are mostly horizontal, and the tendency to ascend or to descend, as above distinguished, may be difficult to ascertain. In *Beaufortia* there is

a single, amphitropous, broad, almost orbicular ovule, peltately attached to the centre of the disk of an orbicular peltate placenta. This curious-looking arrangement strikes at first as a remarkable anomaly; but a careful examination shows in most species a pair of more or less abortive ovules near the upper margin of the placenta, concealed under the perfect peltate ovule, or sometimes shortly prominent in *B. decussata* and *B. squarrosa*. In the adjoining genus *Regelia*, these two upper ovules become perfect, as well as a fourth, collateral with the perfect one of *Beaufortia*, bringing the arrangement to the ordinary two rows of amphitropous ovules, all in this case peltate.

In the unilocular Chamælaucieæ the ovules are always more or less amphitropous, and in pairs or in two rows. In the subtribe Euchamælaucieæ the excentrical placenta, either short, basal, and free, or adnate to the wall of the cavity on one side, but not extending to the summit, shows pretty clearly that we have here a gynæcium reduced to a single carpel; and the placentation is thus normal. But in *Calythrix* and *Lhotzkya* (forming the subtribe Calythriceæ) the two ovules, although still amphitropous, are quite straight and collaterally affixed to a filiform placenta, attached to the base and summit of the cavity, but usually free from its walls, although sometimes excentrical; and the question arises, does this placenta represent the single placenta of the monocarpellary Euchamælaucieæ, or is it the reduced dissepiment of a bicarpellary ovarium with uniovulate cells, like that of some species of *Scholtzia*? And the problem is not satisfactorily solved by the examination of the three connecting genera, *Homalocalyx*, *Thryptomene*, and *Micromyrtus*, provisionally grouped in the third subtribe Thryptomeneæ. All three have the habit of *Bæckea*; *Homalocalyx* has the stamens of Calythriceæ with the placentation of Euchamælaucieæ; *Thryptomene* has the stamens of *Bæckea* with the placentation of Euchamælaucieæ; *Micromyrtus* has also the stamens of *Bæckea*, but with a placentation directly connecting Calythriceæ with *Scholtzia*.

Generally speaking, these modifications of the ovules and their placentation afford the best generic characters, the most in accordance with minor characters and general habit. I have analyzed the ovaries of nearly 600 Australian species, and generally from many different specimens of each, and have found no other organs so constant, provided too much weight be not attached to the precise form of the placenta, which is very variable in *Bæckea* and some other large genera. This importance of placentation

has also been well brought forward by Brongniart and Gris in their papers on New Caledonian Myrtaceæ, although it may be doubted whether it may not have led them rather too far in the distinction of genera allied to *Metrosideros*.

5. Fruit.

The fruit of Myrtaceæ gives very important general but not absolute characters, dividing well the whole order into four great types:—the small one-seeded indehiscent nut of Chamælaucieæ; the capsule opening loculicidally at the top of Leptospermeæ; the indehiscent berry, or rarely drupe, of Myrteæ; and the hard indehiscent or operculate, usually large or several-seeded fruit of Lecythideæ; but in each of these tribes there are exceptions—chiefly monotypic or very small genera, or isolated species. And beyond this general distinction it is very rarely that modifications of the fruit are at all available as generic characters.

6. Seed.

The seed, apart from the embryo, is also of very little avail. Its insertion, dependent on that of the ovule, is, of course, when undisturbed, equally important; but it is so frequently modified by the growth of the fruit, that it is always much safer to ascertain it at the time of flowering. The size and shape of the seed, the texture of the testa, its expansion into wings of various shapes, the presence of a small quantity of albumen or its total absence, are very rarely, as far as hitherto known, constant in large genera, and will probably be found still less so when more species shall have been examined.

We now come to the great character of the embryo, to the modifications of which the greatest importance has always been attached, owing, in some measure, to *à priori* reasoning, the danger of which is fully exemplified in Myrtaceæ. To this day I do not believe that the embryo has been seen in one-half of the published species of the order. There are considerable genera, of which I have had hundreds of specimens before me in various stages of flower or fruit, of which the embryo had never been described, and in which I have only been able to see it in two or three seeds, or in which it is still unknown; and the fallacy of presuming upon the embryo from analogy in other respects is shown by the numerous species which the most acute systematic botanists had placed in the wrong genus before the embryo was ascertained. In the tribe Myrteæ, indeed, if we get the ripe

fruit, we can generally find a perfect seed to examine; but in Leptospermeæ it is generally only one or two of the uppermost seeds of each cell that come to perfection; and those fall out the moment the capsule bursts, so that, in herbarium specimens apparently loaded with fruit, nothing is to be found but open capsules, either empty or full of abortive seeds of various sizes, presenting nothing but a hard mass of homogeneous matter.

The modifications in the form of the embryo are, however, so constant in species and, often, in large groups of the order, that the principal objection to taking them as absolute artificial characters is the practical one above-mentioned, of the frequent impossibility of observing them; and they are far from being always natural. The embryo is perhaps nowhere so diversified in a large natural family as in Myrtaceæ. Large cotyledons connected by a slight radicular protuberance, or all radicle* with the cotyledons minute or absolutely imperceptible before germination—nearly globular or long and slender embryos, either quite straight or variously bent, folded or spirally twisted—thick and fleshy, or broad and flat, or contortuplicate and leafy cotyledons are found in genera nearly allied in other respects, or even scarcely otherwise distinguishable. Still there are some peculiarities which, as far as observed, are so constant as to justify, in some degree, the high opinion entertained of their value, and requiring therefore some special notice.

In the few species of Euchamælaucieæ where I have been able to observe it, the embryo, under a thin testa, fills the cavity of the fruit, taking the general form of the calyx-tube. It presents an obovoid mass, the top nearly flat, upon which lies a slender appendage or neck, which I at first took to be the radicle till I observed in one case a minute notch at the point, showing that it is, on the contrary, the cotyledonar end, analogous to that of *Bæckea*. In the Calythriceæ, always included among Chamælaucieæ, the embryo is quite straight, usually linear and terete, with short cotyledons at the upper end, although in two species it becomes broader, almost obovoid, with the short cotyledons at the upper broad end, not at the lower small end as in *Bæckea*. In the Thryptomeneæ, connecting Chamælaucieæ with Bæckeeæ, the embryo is only known in two or three species, where it is similar to that of *Bæckea*.

* I use the word *radicle* in the ordinary sense, designating the solid part of the embryo below the cotyledons, quite independently of the question of how much of it forms part of the descending axis.

This *Bæckea*-embryo has great analogy with that of the few Euchamælaucieæ where it is known, but in a somewhat reversed position. The general form is that of an obovoid mass with a small narrow recurved neck; but this neck, instead of lying flat on the upper broad end, is turned up from the lower more or less attenuate end, and much more distinctly divided into cotyledons at the tip. This is the general type, as far as is known, in *Bæckea*, *Scholtzia*, and *Micromyrtus*, varying in different species in the neck longer or shorter, straight or transversely folded or twisted, and in the degree of development of the cotyledons. In *Astartea* the embryo is probably the same, but as yet unknown.

The next general type is that of *Leptospermum*. The radicle has lost its predominance; it is straight, linear, and terete, as in *Calythrix*, but usually reversed, and smaller than the flattened cotyledons, although not so much so as in some other genera. Between *Bæckea* and *Leptospermum* we have placed three genera—*Hypocalymma*, *Balaustion*, and *Agonis*. In the first, *Hypocalymma*, the stamens are nearly those of *Leptospermum*, of which Endlicher made it a section, the foliage that of *Bæckea*, and the embryo, as far as known, nearer to that of the latter genus than of *Leptospermum*, being a thick obovoid mass, the lower somewhat attenuate end either straight and entire or very minutely incurved and notched; but I have only succeeded in examining three good seeds in the whole genus. In *Balaustion* the embryo is entirely unknown. The third intermediate genus, *Agonis*, frequently referred as a section to *Leptospermum*, which it sometimes resembles in foliage, has the stamens of *Bæckea*, with the inflorescence, ovules, and seeds of *Melaleuca*, with which it also agrees in the embryo, the cotyledons much larger, and the cotyledons much smaller in proportion than in *Leptospermum*.

The remaining genera of Leptospermeæ, as far as known, have one general type of embryo, varying often more in species of the same genus than in different genera. The cotyledons are always larger and broader than the cylindrical radicle, but in various proportions. The radicle is superior or inferior according to the insertion of the ovule near the summit or near the base of the cavity of the ovary; it is sometimes nearly as long as the cotyledons, and straight with them or turned down over them, or very short. The cotyledons are sometimes oblong, thick, and almost semiterete, sometimes thick and hemispherical, or broad and flat, or thin, very broad, conduplicate over the incumbent radicle, or contortuplicate. They may be entire or more or less

deeply notched at the insertion of the radicle. In most *Eucalypti* this notch is so deep as completely to divide each cotyledon into two broad conduplicate plates enveloping the radicle. In the large and natural genus *Melaleuca* there are species with narrow and with broad cotyledons, flat or variously folded, very frequently the two cotyledons so folded that each one embraces one half of the other.

The tribe of Myrteæ proper, after abstracting a few anomalous monotypic or very small genera, comprises, according to the lowest estimate, above a thousand species, which some botanists have multiplied to nearly twice that number, all with so little diversity of floral structure and habit that, without the aid of the embryo, they might well have been included in one natural genus. The embryo, however, presents three remarkable types, which, when first observed, were supposed not only to be widely and constantly distinct, but also to correspond with differences in the number of parts of the flower, in the texture of the testa, and other minor characters, and they were gladly seized upon as absolute tests of three great genera or subtribes. These are:—1, the horseshoe-shaped, circular, or spiral embryo of *Myrtus*, *Psidium*, and their allies, consisting of a long terete radicle, with two very small cotyledons at the inner end; 2, the broad, thin, very much folded or contortuplicated cotyledons of *Myrcia*, more or less surrounded by the curved terete radicle; and, 3, the thick fleshy embryo of *Eugenia*, sometimes apparently homogeneous, but more frequently showing the line of separation of two thick hemispherical cotyledons, connected by a very short radicle. Relying upon these characters maintaining throughout the constancy observed in the very few species which he could examine, DeCandolle was enabled to make an apparently excellent distribution of the great mass of succulent-fruited Myrteæ into the three principal groups above mentioned. It was further believed that, as between the three typical genera, *Eugenia*, *Myrtus*, and *Myrcia*, the former might always be known by its 4-merous flowers, and that the latter two, with 5-merous flowers, might be distinguished by their inflorescence and the number of ovules. Further observation has not, however, confirmed this neat demarcation. A large number of South American, especially Chilian species which, from their 4-merous flowers, had been placed in *Eugenia*, prove to have the embryo of *Myrtus*; the cymose, well-developed inflorescence sometimes accompanies the embryo of *Myrtus* as well as that of *Myrcia*; and a few instances are known of embryos intermediate in form

between the typical ones. The embryonic character in the fleshy-fruited Myrteæ is therefore more artificial than was supposed, and is only retained for want of a better one. *Myrcia*, indeed, can generally be known by the ovules, two only in each cell, whilst they are more numerous in *Myrtus* and in *Eugenia*; but the two latter genera, when the peduncles are 1-flowered, have nothing but the embryos to separate them. When several-flowered, the American Eugenias are racemose, the Myrcias and Myrtuses cymose, as well pointed out by Grisebach. The Asiatic and African many-flowered Eugenias are, it is true, cymose; but there are there no Myrcias or many-flowered Myrtuses to confound with them. The Australian Eugenias are chiefly of the Asiatic type; but there are some species of *Myrtus* with the inflorescence of the American Eugenias, obliging us thus to depend solely upon the embryonic character irrespectively of geographical origin.

In Lecythideæ the diversity of embryo, in the ten genera in which it is known, is as great as in either of the other tribes. In *Barringtonia* and *Careya* it is a hard, thick, undivided mass, with a line down the centre, which had been supposed to be the indication of a separation between two cotyledons, until it was shown by Thomson (Journ. Linn. Soc. ii. 47) to be of a pithy nature, and that the real cotyledons are abortive. In *Gustavia* and *Napoleona* the embryo, as in *Barringtonia*, is thick and hard, or fleshy, filling the seed, but, as in *Eugenia*, it consists of two distinct cotyledons with a small radicle. In *Lecythis* and *Bertholletia*, again, we have the same thick mass, but without any indication, as far as hitherto observed, whether it is all radicle without cotyledons, as in *Barringtonia*, or almost all cotyledons with a very small radicle, as in *Gustavia*. In *Planchonia*, otherwise closely allied to *Gustavia*, and in *Lecythopsis*, otherwise closely allied to *Lecythis*, as well as in *Couratari* and *Couroupita*, the cotyledons are much folded, and surrounded by a very long, folded or spiral radicle. In *Petersia*, *Grias*, and *Asteranthos* the seeds are unknown.

Whilst, therefore, the embryo in Myrtaceæ still retains a very high position in the scale of generic characters, we find that when we rely upon it as absolute, as we are compelled to do sometimes for want of a better one, our genera may become artificial, and that in some cases, as in *Melaleuca*, we are obliged to place it below staminal and some other characters.

7. Organs of vegetation and flower in general.

The organs of vegetation, in this as in other large Orders, without supplying absolute characters, afford very useful indications in distinguishing the Order itself from those nearest allied to it, as well as in the distribution of some of the groups.

The stem is always more or less woody, at least at the base. There are no herbaceous genera or species, as occurs in Lythrarieæ and Melastomaceæ, and scarcely any suffrutescent. Nearly all, or perhaps all when arrived at their full growth, are shrubs or trees.

The leaves are always opposite in Myrteæ, opposite, alternate, or scattered in Chamælaucieæ and Leptospermeæ; and in these three tribes the leaves as well as other herbaceous parts are almost always, perhaps always, glandular-dotted; for in the few species in which the dots are said not to exist, I have usually found them when I have seen the young leaf, before they become concealed by the density of the texture of the full-grown coriaceous leaf; and these dots do not exist in the Orders most nearly allied to them in floral characters. The tribe Lecythideæ, however, has alternate leaves without dots; but in them the floral characters are exclusively Myrtaceous. The leaves are always entire, or very rarely obscurely crenate; their shape and venation is various; but the peculiar venation of Melastomaceæ exists only in two very small genera of Myrteæ—*Rhodamnia* and *Rhodomyrtus*. A few subtribes and genera affect a peculiar foliage, which assists in their determination, but not in general within any definite limits.

The general character of the Order is to have no stipules. In the very few cases where they are found, they are so very minute and fugacious that they can only be regarded as rudimentary.

Inflorescence, although it can scarcely be taken as an absolute character, is often one of the best indications of generic affinity. In the great majority of Chamælaucieæ, in Euleptospermeæ and Beaufortieæ, and in several genera of other tribes or subtribes, it is simple, the growth and ramification of the flowering-axis does not differ from that of the foliage-axis; each flower is solitary in the axil of the floral leaf or subtending bract, sessile or pedicellate, with a pair of bracteoles, more or less conspicuous under the flower, without any floral buds in their axils. When the flowering-nodes are distant, the subtending leaves often do not differ from the other stem-leaves, although even then they are sometimes

more or less altered in size, shape, or colour; but when the flowers are so crowded as to form a head or spike, the floral leaves are usually reduced to bracts, either small and concealed by the enlarged bud when ready to open, or larger and imbricate in the bud, and falling off as the flower expands. In some cases the lower bracts or floral leaves of the spike, together with a few empty ones immediately below the spike, are enlarged, imbricate, dry, and scale-like, or coloured and petal-like, forming an involucre under or enclosing the spike. Occasionally a few of the upper floral leaves are coloured and enlarged into a crest crowning the spike. And in the great majority of those Myrtaceæ which have a capitate or spicate inflorescence, the axis, after the flowering is over, or even at an earlier period, continues to grow beyond the spike, producing, instead of floral leaves, stem-leaves like those below it. This explains the numerous cases where the flower-heads are all strictly terminal, whilst the fruits form clusters surrounding the base of the year's shoots.

In these simple inflorescences the flowers are constantly closely sessile in *Melaleuca* and several allied genera, more or less pedicellate in *Bæckea* and others; but the same character is variable in *Leptospermum*, *Kunzea*, &c., where, indeed, it often happens in one species that some flowers, especially females, are closely sessile, whilst others, especially males, are pedicellate.

The racemose inflorescence of American *Eugeniæ* must also be regarded as simple. The axillary raceme is a reduced branch, and often grows out, like the spike of Euleptospermeæ, into a normal leafy branch,—a circumstance upon which Berg's genus *Stenocalyx* was chiefly founded, but which forms but a very vague generic character. The racemes of Lecythideæ are more determinate; and although their ramification be the same in principle as that of the leaf-branches, there is this difference, which appears constant, that the rachis never grows out into a leafy branch.

In the truly compound inflorescences of Myrtaceæ, buds are produced in the axils of the bracteoles, developing each a single flower or a several-flowered branch, producing thus the determinate centrifugal cyme. This inflorescence occurs in Myrteæ, Metrosidereæ, and Bæckeeæ, but not in other tribes or subtribes, except rarely in *Thryptomene*, otherwise nearly related to *Bæckea*. Within the tribes the compound inflorescence is often characteristic of large groups, and assists in the distinction of genera (as, for example, in separating many-flowered *Myrti* from American *Eugeniæ*), but it is rarely absolute throughout a genus.

In Eucalypteæ the cymes are altered to umbels, either solitary or several together on a common peduncle forming a panicle—a constant character even in the few species allied to *E. tessellaris*, where the inflorescence is disguised by the umbels being reduced each to two or three flowers, and crowded several together on a common peduncle, or in a few other species, as in *E. eximia*, where, the flowers being sessile, the umbel is reduced to a head.

In Metrosidereæ the inflorescence, almost always compound, is often variable or irregular. Usually cymose, the cyme sometimes passes into the umbel or into the raceme, connecting occasionally in one genus the several inflorescences so distinct in other cases.

The variations in size, shape, colour, persistence, &c. of bracts and bracteoles, usually constant in species, and often much affecting the general aspect of the plant, have been sometimes made use of for generic distinction. It has, however, appeared to me that they can never be safely relied upon, except as serving for a purely artificial distribution of species, as, for instance, in *Darwinia*.

The flowers are more or less unisexual in many Myrtaceæ, especially in the tribe Leptospermeæ; but although this is more frequently the case in some genera than in others, the circumstance can never be taken as a generic character. The unisexuality is never, perhaps, absolute, and varies much in degree, even in different varieties of the same species.

I shall now proceed to consider the several tribes and genera adopted in our 'Genera Plantarum,' and offer a few remarks on the limits we have been induced to assign to them.

Tribe I. Chamælaucieæ.

When Chamælaucieæ were chiefly known by the genera *Calythrix* and *Verticordia*, and when all the species ranged under *Bæckea* were supposed to have a perfectly 2- or 3-celled ovary, the differences between Chamælaucieæ and other Myrtaceæ appeared very striking; and Lindley (Veg. King. p. 721) raised them to a distinct Order, "on account of their very peculiar aspect, which resembles nothing among Myrtleblooms, except some Bæckeas, their remarkable abortive stamens, their simple ovary, which never indicates a trace of being formed by the adhesion of more carpels than one, and their pappose calyx." Since then, however, the careful examination of all the varied forms assumed by species of *Bæckea* and Bæckea-like plants,

the comparison of their ovaries with those of Chamælaucieæ, and the discovery of many new connecting links have shown that the two groups can no longer be separated as distinct Orders. Their peculiar aspect passes gradually into that of *Bæckea*, *Leptospermum*, and their allies, and is a little departed from in a few of the larger-leaved Darwinias; their ovary (which remains the chief character of the tribe) does not appear to be always so really simple as was supposed; for the peculiar filiform placenta of *Calythrix* attached to the base and summit, as well represented in Lindley's fig. 2 (Veg. Kingd. p. 721), is shown by a comparison with that of some Scholtzias to be most probably a reduced dissepiment, in which case the two ovules would belong to two carpels; the abortive stamens are only in 4 genera, including 71 species, whilst they are all perfect in 7 genera, including 72 species; and the calyx-lobes can scarcely be compared to pappus-scales, except in the two large and striking genera *Calythrix* and *Verticordia*. We have therefore now reduced Chamælaucieæ to a tribe of Myrtaceæ, somewhat artificially characterized by the one-celled ovary. In other respects there appear to be more grounds for separating *Calythrix* and *Lhotzkya* from the remainder of Chamælaucieæ than for removing some genera of the latter, especially *Thryptomene* and *Micromyrtus*, from the true Bæckeeæ.

Actinodium, Schau., with which the series of genera is usually commenced, is a single species which has all the aspect of *Darwinia*, and might well have been included in that genus without interfering with the characters which separate it from others. It is maintained, however, to avoid the extension of the character of the larger genus in two remarkable instances: the flowers are 4-merous in *Actinodium*, always 5-merous in *Darwinia*; and none of the numerous species of the latter genus show any tendency towards the remarkable outer ring of barren flowers of *Actinodium*.

I have already had occasion to lay before the Society the history of the genus Darwinia, Rudge, in a paper printed in the Journal, vol. ix. p. 176. Since that time I have been enabled, through the kindness of Dr. Fenzl, of Vienna, to ascertain that the genus *Francisia*, Endl., was founded on a drawing of Bauer's of the original *Darwinia fascicularis*, Rudge. There is also every reason to conclude that a cultivated plant of the same species, of which no specimen was preserved, supplied F. Mueller's MS. description of *Cryptostemon fascicularis*, published by Miquel (Nederl. Kruidk. Arch. iv. p. 115).

Homoranthus, A. Cunn., is a single species which has scarcely even the claims of *Actinodium* to be excluded from *Darwinia*, differing from the latter genus only in the subulate calyx-lobes. Its retention may, however, be justified as facilitating the distinction between *Darwinia* and *Verticordia*.

Verticordia, DC., contains at present 37 species, showing considerable diversity in the structure of the anthers as well as in the ovules, and connected together by the single character of the dissected or plumose calyx-lobes; but this character gives so peculiar an aspect that it is justly allowed to supersede all others, and the genus is universally acknowledged in its integrity. The only separation proposed was Lindley's *Chrysorrhoë*, in the original species of which a very singular form of anther was observed to be connected with the bright-yellow flower. Subsequent researches, however, have shown in other species a gradual passage from these singular-shaped anthers to one of the two normal types of the genus, and that they do not correspond at all with the colour of the flower; and *Chrysorrhoë* was very soon given up even as a section. The division of *Verticordia* into two artificial sections, by the same characters which supply the more natural separation of *Darwinia* from *Chamælaucium*, has been already alluded to; and further details on the arrangement of the species are now superseded by the 'Flora Australiensis.'

Pileanthus, Labill., is an old genus of two or three species, characterized, again, chiefly by the calyx, in which accessory lobes are produced from the sinus precisely resembling the primary ones, the whole ten being broad, petal-like, and spreading, giving the calyx a shuttlecock-aspect, accompanied also by a conversion of the staminodia into stamens, thus doubling the number of perfect stamens as well as of calyx-lobes. As the petals remain limited to the normal number of five, we have no reason to suppose that the calyx is really composed of more than five sepals, and conclude that the accessory lobes are, as already mentioned, a mere expansion of the joint-nerve, produced by the union of two lateral nerves of two adjoining sepals. The other characters and habit of *Pileanthus* are those of *Chamælaucium* and *Verticordia*.

Chamælaucium, Desf., the first-established genus of the group, closes the remarkable and very distinct series of Chamælaucieæ proper, and, as already observed, is distinguished from *Darwinia* by the anthers, and from the other genera by the calyx. It has been generally recognized in its true limits, the only separation proposed being by Turczaninow, who described one species as a new

genus, under the name of *Decalophium*: but that was probably from ignorance of the true *Chamælaucia*; for he at the same time published the original *C. ciliatum*, Desf., as a new *Genetyllis*.

CALYTHRIX, Labill., and LHOTZKYA, Schau., with the habit of Chamælaucieæ, and therefore included in them by all botanists, have nevertheless some peculiarities of structure which distinguish them much more from the above-mentioned genera than from some Leptospermeæ. The stamens, always indefinite and in several rows (or very irregularly 1-seriate), even when reduced to below 10, are unknown in Euchamælaucieæ, and only found in *Homalocalyx* among Thryptomeneæ; the peculiar placentation and embryo have already been alluded to. All these characters, if not strictly intermediate between those of Chamælaucieæ and Leptospermeæ, show a rather more general affinity to the latter than to the former; yet the technical character derived from the unilocular ovary, and the general aspect given by foliage and inflorescence, oblige us to retain them in the tribe of Chamælaucieæ.

Calythrix is the principal genus amongst Myrtaceæ in which minute, almost hair-like bodies, at the base of the leaves of a few species, have been described as stipules. If they are really to be considered such, which may be as yet somewhat doubtful, they are quite rudimentary, and so uncertain in the few species where they have been observed as to be useless for systematic description, whilst at the same time they appear to perform no function in the economy of the plant.

The name *Calythrix* has been objected to by some German purists, and altered to *Calycothrix*, as being derived from κάλυξ and θρὶξ; but the elision of the hard terminal consonant of *calyx* in composition, if not classical, has received the sanction of botanists in other cases, as in *Calydermos*, *Calystegia*, &c., besides having been fixed in the present case by the right of priority. At any rate, if strict rules of etymology were followed, the alteration would be to *Trichocalyx* (a name already preoccupied), not to *Calycothrix*; for the meaning intended to be conveyed was *hair-like calyx*, not *calyx-like hairs*.

With regard to the separation of *Lhotzkya* from *Calythrix*, as proposed by Schauer, there has appeared to me no inconvenience in maintaining it, although in opposition to the more recent views of F. Mueller. The constant want of any point or awn to the calyx-lobes, in all the eight species known, give it a very distinct aspect; and there can be no difficulty about the supposed inter-

mediate species (*Calythrix brachychæta*, *C. achæta*, and *C. laricina*); for in all three the awn, although short, fixes at once their place in *Calythrix*.

Under the subtribe Thryptomeneæ I have included three genera, HOMALOCALYX, F. Muell., THRYPTOMENE, Endl., and MICROMYRTUS, Benth., which, in aspect, and as far as is known in their seeds, differ but little from *Bæckea*, in which the few early known species were included, until the discovery of their unilocular ovarium induced their removal to Chamælaucieæ. Even since the importance of this character has been pointed out, several of these *Bæckea*-like Chamælaucieæ have been first published as Bæckeas or as Scholtzias, the impatient anxiety of species-makers to establish their new names preventing their previously examining the structure of these minute flowers with the necessary care.

With regard to the three genera adopted in the 'Flora Australiensis,' F. Mueller is now disposed to unite them into one, although the first, *Homalocalyx*, was originally proposed by himself upon characters which appear to me to be substantial, it having the stamens of *Calythrix* and *Lhotzkya* with the ovary of *Chamælaucium*. Of the two species, however, which I have brought under it, one, *H. polyandrus*, F. Muell., is as yet only known from somewhat imperfect and perhaps abnormal specimens; and of the original one, *H. ericæus*, F. Muell., we have not yet the ripe seed, which may further confirm or possibly invalidate the genus. The principal genus, *Thryptomene*, now consisting of 17 species, has the habit and almost the stamens of *Bæckea*, with the ovary of *Chamælaucieæ*. It was originally established by Endlicher on a then unpublished species. To this Schauer added the *Bæckea saxicola*, A. Cunn., which he had previously separated from *Bæckea*, under the name of *Astræa*, and which has since been somewhat carelessly published by Baillon under the name of *Eremopyxis* (mistaking it for *Bæckea camphorata*, Br.), and by F. Mueller as a new *Scholtzia*. The third species known to Schauer was established by him as a distinct genus under the name of *Paryphanthe*, founded chiefly upon the number of stamens, 5 instead of 10—a character which, in the five species in which it occurs, is unaccompanied by any other difference in character or habit, and therefore at most sectional. The third genus, *Micromyrtus*, was first established in the 'Flora Australiensis.' It is certainly very near to *Thryptomene*; but the differences there indicated in the ovules and placentation, in the very deciduous petals, in the position of the stamens when reduced to 5, and possibly in the seed, appeared to me to be so

combined as give greater facilities for the general arrangement of the Order if treated as generic than as sectional.

Tribe II. Leptospermeæ.

The long series of 2- or more-celled capsular genera forming the tribe Leptospermeæ are nearly all Australian, and most of them exclusively so, or at most emitting a few species into New Zealand, New Caledonia, or some of the islands of the Indian archipelago and the Pacific; and most of them, although perhaps not quite so vague as the baccate Myrteæ, yet pass into each other through intermediate species which render their delimitation much more difficult than in the case of Chamælaucieæ. On the other hand, some of the differential characters are so striking, that, if the ambiguous species were overlooked, there would appear to be several well-marked subtribes. The first one especially, the Bæckeeæ, has always, as far as known, the minute cotyledons of Chamælaucieæ, accompanied usually by opposite leaves and definite or uniseriate stamens; whilst in the following subtribes the cotyledons are as long as or longer than the radicle, the stamens usually indefinite, and 2- or pluri-seriate, with varying leaves. The apparently positive character of the embryo remains, however, to be confirmed in some intermediate species, of which the ripe seed is unknown.

Scholtzia, Schau., which I have placed first, as connecting *Micromyrtus* with *Bæckea*, is so near the latter genus as to have been made a section of it by De Candolle. It also shows both the forms of anthers prevalent in *Bæckea*. As, however, the arrangement of the ovules, 2 superposed in each cell, is accompanied usually by a rather peculiar inflorescence, and as some species, by their apparently incomplete dissepiments of the ovary, show an approach to *Micromyrtus*, it has been thought convenient to maintain the genus as distinct. *Piptandra*, Turcz., has no character whatever to distinguish it from other species of *Scholtzia*, which have constantly, or occasionally, 3 cells to the ovary.

The typical genus, Bæckea, Linn., was originally supposed to be well characterized by definite stamens and a 2- or more-celled ovary with a heath-like habit; but as numerous exceptions have been successively discovered, it has been variously understood by different botanists. Some include *Thryptomene*, *Micromyrtus*, *Scholtzia*, and *Astartea*, all of which have a similar habit, but with structural differences, which may justify their maintenance as

distinct. Others, again, have broken up what remains of the genus into eight or nine small ones; and, as long as only a few species showing remarkable differences in the anthers, ovary, &c. are taken into account, that course would seem justifiable; but on a repeated examination of about 45 species as we understand them, or of above 60, if all those proposed by Schauer, Miquel, and others be adopted, the differences have been observed to pass so gradually from the one to the other, that, even as sections, the best groups we have been able to establish are but vaguely defined or purely artificial. Of these sections we have adopted six, for which we have taken the names of Schauer's genera, *Rinzia*, *Euryomyrtus*, *Schidiomyrtus*, *Harmogia*, and *Oxymyrrhine*, and of Lindley's *Babingtonia*, all of them founded upon single species (except *Harmogia*, which had three) now placed in the corresponding sections, but with sectional characters necessarily very much modified by the grouping around them of additional species.

The most constant character we have found to divide the genus into two groups is one which appears to have been overlooked by Schauer. In *Rinzia* and *Euryomyrtus* the stamens are never reduced below ten, and amongst them there is always one opposite to the centre of each petal, usually larger than the others, or with a more flattened filament; whilst in the other four sections the stamens are much less definite in number, varying from under 5 to above 30, and none are opposite to the centre of the petals, except perhaps in *B. polyandra*, where they are very numerous. Some other characters are general, but not constant, in the two divisions. The ovules are reduced to 2 or 3 in each cell in several species of the first, never in the second; the anthers are uniformly parallel-celled and rimose in the first, heteromorphous in the second. The ovary, as observed by Schauer, is superior, or nearly so, in the original *Rinzia* and one other species, half superior in three others, and almost entirely inferior in *B. dimorphandra*, which cannot otherwise be removed from *Rinzia*. The section, indeed, is only distinguishable from *Euryomyrtus* in the remarkable dilatation of the filaments, *B. diffusa* alone in *Euryomyrtus* showing some approach to it.

The four sections of the second division are technically, but unfortunately not very definitely, distinguished by the anthers; the cells are (as in the first division) distinct, parallel, and rimose in *Schidiomyrtus*, united and porose in *Babingtonia*, intermediate in *Harmogia* and *Oxymyrrhine*. The ovary is also 2-celled in all the species of *Schidiomyrtus*, except *B. astarteoides*, 3-celled in the

other three sections. Of the two intermediate sections the anthers of *Harmogia* approach nearest to those of *Schidiomyrtus*, and the species are all eastern; whilst the anthers of *Oxymyrrhine* tend rather towards *Babingtonia*, and the species are all western. So little, however, do the last three sections really differ from each other that when new species have been discovered they have been placed indiscriminately in the one or the other; and F. Mueller has in several instances published them at once as Bæckeas, as Harmogias, and as Babingtonias, giving his readers the option as to which name to select. Of the additional genera proposed, *Camphorosma*, Schau., does not appear to me to differ in the slightest degree from *Harmogia*, and *Tetrapora*, Schau., and *Ericomyrtus*, Turcz., to be inseparable from *Babingtonia*. The common *Bæckea fruticosa* of the Indian archipelago is not exactly represented in Australia, although *B. stenophylla*, F. Muell., from Queensland, comes very near to it. The three or four New-Caledonian species comprise varieties of *B. virgata*, which is widely spread in Eastern Australia, and is there very variable, and a few forms nearly allied to it, but which may be constant enough to be maintained as species.

The following small genus, Astartea, DC., is separated from *Bæckea* by the purely artificial character of the stamens collected in bundles or clusters, on which account it had always been placed in a different subtribe, next to *Melaleuca*. This, however, appears to be a mistaken view of real affinities. The clusters or bundles of stamens in *Melaleuca* and its allies are always opposite to the petals, whilst in *Astartea* they alternate with them, the arrangement thus corresponding with that in those polyandrous species of *Bæckea* in which the ring of stamens is interrupted opposite to the petals. Indeed the *Astartea ambigua*, F. Muell., shows so nearly the staminal arrangement of *Bæckea*, and the aspect of the whole genus is so *Bæckea*-like, that it is kept up rather in deference to general usage than from its intrinsic value.

Hypocalymma, Endl., in its more numerous stamens, and sometimes in inflorescence, assumes the aspect of *Leptospermum*, and it was first published as a section of that genus; but the opposite leaves and the inflorescence of some species connect it with Bæckeeæ, where also it is more decidedly placed by the embryo, if, indeed, it be constantly similar to that of the only species of which the perfect seed has been examined.

Balaustion, Hook., published also by Drummond under the name of *Cheynia*, has most of the floral characters as well as the

foliage of the polyandrous Bæckeas, with which F. Mueller thinks it should be united; but the large coloured calyx gives to the single species so peculiar an aspect, that we were unwilling to suppress the genus, so long, at any rate, as the fruit and ripe seeds shall remain unknown.

The remaining Leptospermeæ have, as far as known, the cotyledons always as long as or longer than the radicle; and the stamens, when not forming a regular ring, are (except in *Agonis*) gathered in clusters or bundles opposite to the petals, and interrupted opposite to the sepals, whilst the reverse has been seen to take place in the polyadelphous Bæckeeæ. They comprise four groups or subtribes, viz.:—(1) Euleptospermeæ and (2) Beaufortieæ, agreeing with each other in their small or narrow coriaceous leaves, and almost universally closely sessile flowers, but differing in the anthers, versatile in Euleptospermeæ, erect and fixed by the base in Beaufortieæ; (3) Eucalypteæ, usually with large leaves and pedunculate, mostly umbellate flowers, and remarkable for the truncate calyx and broad truncate base of the petals, whether united in a calyptra or separately deciduous; and (4) Metrosidereæ, which have myrtle-like or large leaves and pedunculate flowers, with the petals rounded or contracted at the base, as in Euleptospermeæ.

The Euleptospermeæ comprise four genera with free stamens, and three with polyadelphous ones. The first one, Agonis, DC., agrees in its alternate leaves and short stamens with *Leptospermum*, of which it was formerly considered a section; but the arrangement of the stamens is exceptional in the subtribe, being precisely that of Bæckeeæ, whilst the inflorescence and ovary are nearer to those of *Melaleuca* than of *Leptospermum*. The seeds also, as far as known (for they have been seen in three only of the ten species), agree with *Melaleuca*, and prevent our ranking *Agonis* amongst Bæckeeæ; we have therefore placed it at the commencement of Euleptospermeæ as a connecting link between the two subtribes.

Leptospermum, Forst., is an old genus, which we found in a singular state of confusion. In the first place, it long formed a common receptacle for all capsular Myrtaceæ with small coriaceous leaves and numerous short stamens. Again, a few common species, scarcely distinguishable by any positive characters, are yet so polymorphous, especially in our gardens, as to have been enormously multiplied by horticultural botanists, whilst almost all those which showed any tangible specific differences

have been at various times proposed as distinct genera. And, lastly, notwithstanding the facility of examining living specimens of several species common in our plant-houses, errors in some of the important characters originally misunderstood have been servilely copied by almost all modern botanists.

After removing a few true Bæckeas, which the older authors had included in *Leptospermum*, and adopting as genera the sections *Hypocalymma*, Endl., with a Bæckeoid foliage and probably embryo, and *Agonis*, DC., with Bæckeoid stamens and erect ovules, both with the inflorescence of *Melaleuca*, there remains a not unnatural group, differing from *Kunzea* and *Callistemon* chiefly in the stamens not exceeding the petals, and including the genera *Fabricia*, *Macklottia*, *Homalospermum*, and *Pericalymma*, proposed or adopted by modern monographists.

Fabricia was characterized and figured by Gærtner as having a single winged peltate seed, filling each cell of the capsule; but this was a mistake. The ovules in both his species are exceedingly numerous. It is true that, as in some other species of this and allied genera, only one or two in each cell form perfect seeds, the remainder either remaining small and abortive, or more or less enlarging into linear or misshapen barren seeds, and that in the *Fabriciæ* the perfect ones are broad and acutely angular, or more or less winged, whilst in typical Leptospermums the perfect as well as the barren ones are narrow-linear; but this appears to be rather a sectional than a generic character. Gærtner's error was owing to the fruits he examined in the Banksian collection having been unripe, with the valves opened in dessication, as frequently happens in woody-fruited Myrtaceæ. In this state the unripe ovules, with the placenta, readily detach themselves in a peltate mass, which Gærtner mistook for, and figured as, the seed, without dissecting it. Gærtner's two species of *Fabricia* have, moreover, usually ten cells to the ovary, whilst the typical Leptospermums have five or fewer; but this distinction is not constant. The *Fabricia coriacea*, F. Muell., since reduced by that author to a variety of *Leptospermum* (*Fabricia*) *lævigatum*, has from six to eight cells, and *Homalospermum*, Schau., a single species, with the seeds and other characters of the section *Fabricia*, has always four cells to the ovary.

The typical *Leptosperma* (section *Euleptospermum*), with numerous ovules and linear seeds, comprise a long series of forms, which, according to Schauer, or to the earlier views of Mueller, as published by Miquel, or to several horticultural botanists, would

constitute between thirty-five and forty, or even more, species; but their characters are exceedingly vague and variable, and they appear all to be connected by an almost infinite series of intermediate gradations. In arranging the large mass of specimens I had before me, for the 'Flora Australiensis,' I thought I could distinguish twelve types which might rank as species, besides two rather more distinct ones with 3-celled ovaries; but it must be confessed that the characters of those twelve are often unsatisfactory, and a much further reduction, as now proposed by F. Mueller, might well be justified, even though it might lead to the uniting the whole twelve into a single one.

The *Leptosperma* from the Indian archipelago belong to the same series as the twelve Australian ones; and one of them, *L. amboinense*, DC., appears indeed to be identical with the Australian *L. flavescens*, Sm. They are proposed by Korthals as a distinct genus under the name of *Macklottia*. He does not say upon what grounds; for he gives no amended character of *Leptospermum*; but from that of his *Macklottia* it is probable that he founded it on the imbricate calyx-lobes, previous authors having described them as valvate, an error adopted by Blume in his detailed character of the archipelago species; and even Miquel (Fl. Ind. Bat. i. pars 1. p. 403), in reducing *Macklottia*, says, "Calycis . . . limbi . . . laciniis æstivatione haud imbricatis." I have, however, in both the archipelago species, as well as in all others, found the calyx-lobes constantly imbricate in the bud, as described by Korthals.

The three remaining *Leptosperma*, all from South-west Australia, form the section *Pericalymma*, Endl., characterized by a reduced number of ovules and a peculiar habit. Schauer, in raising the section to generic value, includes in the characters the 3-celled ovary; but that, as has been seen, occurs in two species of *Euleptospermum* with numerous ovules. As, moreover, the three species of *Pericalymma* are not very definitely distinguished, it may turn out that they form rather a single species of *Euleptospermum* than a sectional group.

KUNZEA, Reichb., differs from *Leptospermum* in its exserted stamens, on which account the species formerly known were referred to *Metrosideros*; but the foliage, inflorescence, and structure of the ovary are entirely as in *Leptospermum*, and some of the smaller-flowered species have the stamens sometimes so little exserted as almost to pass into that genus. From *Callistemon* *Kunzea* differs usually in the shorter stamens, the capitate, not

spicate inflorescence, and especially in the ovules, pendulous as in *Leptospermum*, not ascending as in *Callistemon*. This character in the typical section *Eukunzea*, where the ovules are not very numerous, is very definite; but in a second section, for which I have extended Lindley's name of *Salisia*, the ovules are so densely crowded as to be thrown into a horizontal position, or the upper ones slightly ascending and the lower ones alone really pendulous, thus passing into the arrangement of ovules observable in some specimens of *Callistemon*, where they are equally crowded. *Kunzea Baxteri*, Schau., approaches *Callistemon* also in the colour of the stamens, and to a certain degree in inflorescence, and has, indeed, been published as a *Callistemon*, first by Lindley, and afterwards by F. Mueller, and as a distinct genus (*Pentagonaster*) by Klotzsch; but, from the 5-celled capsule, crowned by the large persistent calyx-lobes, together with the habit and foliage, it would appear to have been better placed by Schauer in *Kunzea*. *K. sericea*, Turcz., is another somewhat anomalous species: the flowers are large, and more unisexual than in other species: the male inflorescences form clusters rather than heads; and, prompted by its apparent beauty, as compared with *Leptospermum*, it was proposed as a genus, under the name of *Salisia*, by Lindley. There appears, however, to be no essential character to separate it from *Kunzea*. The female flowers are solitary and sessile; and it is a fruiting specimen, retaining only three solitary capsules, that Labillardière figured as *Leptospermum sericeum*, whilst he appears to have described the flowers from a specimen of *Leptospermum lanigerum*.

Callistemon, Br., also included by the older authors in *Metrosideros* upon purely artificial grounds, was early removed by Brown as being more nearly allied to *Melaleuca*, with which F. Mueller now proposes to unite it. It appears, however, to be more convenient to retain it as a small natural group, connecting *Kunzea* (and, through *Kunzea*, *Leptospermum*) with *Melaleuca*. We have already seen how it passes into the former through *Kunzea Baxteri*; and on the other hand, whilst it is generally distinguished from *Melaleuca* by the free stamens, there are some forms of *Callistemon lanceolatus*, and especially of *C. speciosus*, where they are more or less distinctly united in clusters at the base, whilst in a few Melaleucas the union in clusters is so short as to be scarcely perceptible. The species of *Callistemon*, estimated by some botanists at about eighteen, but reduced in the 'Flora Australiensis' to ten, are scarcely to be distinguished from

each other but by vague characters of degree in the breadth and consistence of the leaves, in the indumentum of the inflorescence, and in the colour of the stamens.

MELALEUCA, Linn., which, after *Eucalyptus*, is the largest genus of capsular Myrtaceæ, is also a very natural one, so much so, indeed, that all attempts to divide it into good subgenera have failed. It is also very well defined by its exserted stamens united in bundles opposite to the petals and bearing versatile anthers, only passing into *Callistemon* by a very few intermediate forms; and two species only have been proposed as separate genera: one, *M. teretifolia*, Endl., is the *Gymnagathis* of Schauer, without any character at all, for the inflorescence on which it is supposed to have been founded is that of many other species; the other, *M. angustifolia*, Gærtn., or *Asteromyrtus*, Schau., has, with two other species, the calyx-limb falling off after flowering in a circumsciss ring—a character unaccompanied by any other or by any difference in habit, and therefore not available further than for an artificial section. The coherence of the fruiting calyces, which was also relied upon, is not constant in either of the three species. A few species of *Melaleuca* are exceptional in the subtribe Euleptospermeæ by their opposite leaves, but cannot constitute even a distinct section, as they belong to very different natural series. One species, the old *M. leucadendron*, Linn., the only one which from Australia spreads itself over the Indian archipelago and the Malayan peninsula, is, with this very wide geographical range, also singularly polymorphous. It has been divided into more than a dozen species; and most botanists retain two, three, or four as distinct, the extreme forms being widely dissimilar; but the characters, derived chiefly from the shape and size of the leaves, from the dense or interrupted spikes, from the size and colour of the flower, and from the indumentum, are so variously combined in different specimens, the forms at other times pass so gradually one into the other, or differ so much at different ages, or even on different branches of the same tree, that I have completely failed in the endeavour to sort the specimens into distinct races.

The seeds, in the few species where they have been examined in the ripe state, differ considerably in shape, in the presence or absence of wings, and in the shape of the cotyledons of their embryo; but these differences, as far as known, do not appear to be available for the distinction of sectional groups.

LAMARCHEA, Gaud., and CONOTHAMNUS, Lindl., the former monotypic, the latter consisting of two species only, differ from *Me-*

laleuca by single characters only. *Lamarchea*, with the habit of several narrow-leaved large-flowered species, has the staminal bundles united in a single tube; *Conothamnus*, with opposite leaves, has the ovules solitary in each cell of the ovary, as in *Beaufortia*. These genera are only retained with a view to simplify the generic character of *Melaleuca*.

The subtribe of BEAUFORTIEÆ, differing from Euleptospermeæ in the erect anthers attached by the base, consists of the five Australian genera BEAUFORTIA, Br., REGELIA, Schau., PHYMATOCARPUS, F. Muell., CALOTHAMNUS, Labill., and EREMÆA, Lindl., all well characterized and generally admitted, and therefore calling for no special remarks beyond what are given in the 'Flora Australiensis.'

Under the subtribe EUCALYPTEÆ we have brought together the two Australian genera ANGOPHORA, Cav., and EUCALYPTUS, L'Hér., nearly allied to each other but perfectly distinct and never confounded with any other Myrtaceæ. The first, a small genus, has never been disputed since first separated from *Metrosideros*. The other, *Eucalyptus*, which constitutes so large and valuable a portion of the forest-vegetation of Australia, is at the same time the most numerous in species amongst capsular Myrtaceæ. Like all very natural genera, whilst it is readily defined as a whole, its division into sections and species is exceedingly difficult, and at present very unsatisfactory. The best characters which have been found are enumerated and discussed in the 'Flora Australiensis;' but a few words may here be added as to the genera proposed to be separated from it. These are two—*Eudesmia*, Br., and *Symphyomyrtus*, Schau. The former was distinguished by the prominent teeth of the calyx and the tetradelphous stamens; and if these characters had proved constant and tolerably well defined, the separation would have been fully justified according to the principles upon which other capsular genera were at that time distinguished. The claws, however, of the staminal bundles are in the original *Eudesmia tetragona*, Br., so broad and short as to be at best scarcely more than slight dilatations of the staminal disk; and in some specimens the tetradelphy is scarcely perceptible, and the teeth of the calyx are often not more prominent than in *Eucalyptus globulus* and some others; whilst in the species of *Eucalyptus* closely allied to *E. tetragona*, we have two (*E. erythrocorys*, F. Muell., and *E. eudesmioides*, F. Muell.) in which the tetradelphy is more prominent, but the calyx-teeth scarcely perceptible; in another, *E. odontocarpa*, F. Muell., the calyx-teeth are prominent

but the stamens not perceptibly clustered; and in the remaining species which on general grounds would belong to the same section, neither character is clearly appreciable. We have thought ourselves, therefore, compelled to follow F. Mueller in reducing *Eudesmia* to a section of *Eucalyptus*. *Symphyomyrtus*, Schau., has still weaker claims to maintenance. It was founded on *Eucalyptus Lehmanni*, Preiss, a species so closely allied to *E. cornuta*, Labill., that F. Mueller thinks it a variety only, but in which the calyces, instead of being closely sessile only, are more or less immersed in the enlarged and thickened receptacles—a character to which we can by no means give any more than a specific value.

Since the above notes were penned, I have received from Mr. Woolls, of Parramatta, in the 'Sydney Herald' of the 26th of Aug., 1867, a long and interesting article on *Eucalyptus*, in which he strongly objects to my arrangement as "placing in the same group species which, in the eyes of the colonists, are always regarded as perfectly distinct from each other, and also of separating, under various sections, trees which, by bark, wood, habit, and general character, ought to stand near each other." These are, it must be admitted, grave objections; and I should be most ready to adopt any more natural method by which local botanists, having the advantage of observing the species in a living state, may arrange the whole genus into groups marked out by tolerably definite characters. Mr. Woolls thinks that Dr. F. Mueller's cortical system is the best that has yet been devised; but as that has not yet been applied to one half of the genus, and, indeed, seems to be scarcely applicable to the low bushy species, and the characters on which it is founded are, in nine cases out of ten, not to be ascertained from museum specimens, or to be derived only from uncertain or contradictory collectors' notes, it is at present useless to botanists. We must therefore wait to judge of it till Dr. Mueller has worked it out in his promised monograph. In the meantime it must be admitted that this cortical system is probably excellent for the practical arrangement of the tree Eucalyptuses of limited localities. So also in the south of Europe would be the popular arrangement of Oaks into white Oaks, black Oaks, and cork Oaks (Chênes blancs, Chênes-verts, and Chênes-liéges, as they are there called); but botanists would hardly accept of it for the general subdivision of the whole genus *Quercus*.

With regard to the homology of the operculum of *Eucalyptus*, it is said, in the 'Flora Australiensis,' that the single (or, when it is double, the inner) one probably represents the petals,—which is ob-

jected to by F. Mueller, chiefly, I believe, on the ground of its perfect continuity with the calyx-tube in the bud of many species without any circular rim or apparent articulation; that, however, may be observed in the buds of *Angophora*, as well as of some species of *Darwinia* and other Chamælaucieæ, where the minute calyx-teeth leave a broad interval between them. The arguments adduced by Brown (App. Flind. Voy. ii. 600, Works, ed. Benn. i. 75) to show that in *Eudesmia* at least the operculum is formed of confluent petals only, and that in *E. globulus*, and other species where it is double, the outer one may be considered to be formed of the calyx and the inner one of petals alone, have been further confirmed by subsequent observations. The species, however, where the outer operculum exists at an early stage have proved to be much more numerous; and in *E. platyphylla* and *E. maculata* it is much thicker and more persistent than usual, marked often with prominent ribs corresponding with those of the calyx-tube. On the other hand the species where, notwithstanding its apparent homogeneity, the operculum is probably composed of both floral envelopes united, seem to me to be much fewer than was supposed by Brown. The only one where there may be corroborative evidence of the hypothesis is perhaps *E. erythrocorys*, where the exceedingly thick fleshy operculum is marked with four raised ribs corresponding to those of the calyx-tube, and between them are ribs and raised veins, which may be presumed to be those of the petals.

It is remarkable that a genus so extremely abundant, both in species and in individuals, throughout Australia, from the alpine regions of Tasmania and Victoria to the arid burning deserts of the northern coast, should scarcely have been detected beyond its limits. No *Eucalyptus* is known from New Zealand or from New Caledonia. Two only of the northern species have been also found in Timor; but beyond that we have no satisfactory evidence of any extension of the geographical range of the genus. Four species, indeed, are given in books as natives of the more distant islands of the Indian archipelago; but it does not appear that any native specimen undoubtedly referable to the genus exists in any of our herbaria. Of the four species referred to, the one that rests upon the best grounds is perhaps *E. moluccana*, Roxb., described in his 'Flora Indica,' ii. p. 498, from a tree in the Calcutta Garden, said to be a native of the Moluccas, but without any record as to when or by whom introduced, and I cannot find that any specimen or drawing has been preserved. Miquel refers it to *E. alba*, Reinw., a native of North Australia and

Timor; but that is mere guesswork, and Roxburgh's short description is quite at variance with that species. Blume, in his 'Museum Botanicum,' i. p. 83, adds three species:—*E. deglupta*, described from a Celebes specimen in leaf only, which he found in Reinwardt's collection under the doubtful name of *Populus? deglubata*; *E. versicolor*, from the Moluccas, taken up from Rumphius's description and rude figure of *Arbor versicolor Ay-alla* (Herb. Amb. iii. p. 122, t. 80, not t. 53, which is an *Eugenia*) without flowers or fruit; and *E. sarassa*, Blume, founded on Rumphius's incidental mention of the *Sarassa*-tree in the same article, all three species conjecturally referred by Blume to *Eucalyptus* on account of their resinous bark, described as detaching itself in patches. A fifth species from a still more distant region, Mindanao, one of the Philippine islands, is described by A. Gray in the 'Botany of the American Exploring Expedition,' p. 554, under the name of *E. multiflora*, Rich., from a specimen in leaf, and with a panicle of old fruits from which the calyx-limb and operculum, if any, are fallen away, and the open capsules have lost all their seeds. The 4-celled (not 3-celled) capsule is the only character leading us to suppose that it may be a *Eucalyptus* rather than a *Tristania* or a *Metrosideros*. No mention of it occurs in Blanco's 'Flora.'

The Metrosidereæ, forming the last subtribe of Leptospermeæ, scarcely differ from Euleptospermeæ in their floral or carpological characters, but form a not unnatural group, chiefly distinguished by their inflorescence and foliage, which connect them with Myrteæ, almost passing, indeed, into that tribe through *Backhousia* and *Osbornia*. One or two species of *Metrosideros* and perhaps of *Tristania* have something of the aspect of *Eucalyptus*, but not the inflorescence; nor do any of the subtribe ever show the closely sessile flowers of Euleptospermeæ. If, again, some of the smaller-leaved Metrosidereæ may occasionally approach in habit a few of the larger-leaved Bæckeeæ, the stamens, and especially the embryo, will always supply good distinctive characters. The Metrosidereæ contain also a larger proportion of extra-Australian species than any other subtribe of capsular Myrtaceæ.

The proper division of the tribe into genera and subgenera is not easy to determine upon—not so much from the want of tangible characters, as in Myrteæ, but from the number of monotypic or almost monotypic forms, which leave it doubtful and in some measure an arbitrary matter whether they should be considered specific, sectional, or generic. We have, in our 'Genera Plantarum,' admitted eleven genera; but the number might, with almost equal

propriety, be raised to fifteen, or, perhaps still better, reduced to six.

Acicalyptus, A. Gray, was established for a species from the Fiji Islands, to which afterwards a second was added from the same locality, both of very doubtful affinity, being only known from specimens in flower and bud. A. Gray, from the appearance of the ovary, suspected that the fruit was capsular, and on that supposition indicated the affinity to *Eucalyptus* in its 4-merous flowers and circumsciss operculum. This operculum, however, is in both species evidently formed of the calyx alone, with the free petals inside as in *Calyptranthes*, not of the corolla alone or combined with the calyx as in *Eucalyptus*; and we therefore, in the 'Genera Plantarum,' acting still on the supposition that the fruit was probably capsular, placed it at the commencement of Metrosidereæ instead of among Eucalypteæ. Since then Seemann has discovered, amongst his Eugenias from the same islands, what he presumes to be a third species, in which he finds the fruit to be baccate; and he therefore reduces the whole to *Calyptranthes*. In this he may be right; but at present it can but be the result of pure conjecture, the seed being unknown or at least unexamined; the appearance of the ovary and the 4-merous flowers, as well as the geographical station, are against the union. The habit and the arrangement of the petals in the third species (*Calyptranthes eugenioides*, Seem.) are also much more those of *Eugenia*, sect. *Syzygium*, than of *Calyptranthes*. Our specimen has no fruit, so that we can determine nothing; but should the seed prove, as is probable, to have the *Eugenia* embryo, then A. Gray's genus *Acicalyptus* will stand under that name or be reduced to *Cleistocalyx* of Blume, but must be transferred to Myrteæ, next to *Eugenia*.

Tristania, R. Br., with the 5-adelphous stamens of *Melaleuca*, has the habit, inflorescence, and other characters of Metrosidereæ. It differs from *Metrosideros* and its immediate allies, besides the stamens, in the ovules tending downwards instead of upwards, and usually in its alternate leaves. It comprises, however, three sections, having almost as strong claims to be considered distinct genera as the small genera more closely allied to *Metrosideros*, but which it appears more convenient to follow Brown in retaining under one generally adopted generic name. The most distinct is *Neriophyllum*, in which the leaves are opposite, the ovules are numerous and mostly horizontal, and the union of the stamens in bundles is less decided than in the other sections. It consists, however, but of a single Australian species, and no object

would be gained by its separation. The other two sections, with alternate leaves, have both been proposed as genera. The one, *Lophostemon*, Schott, characterized by the remarkably long staminal claws, has also the numerous ovules of *Neriophyllum*, and linear-cuneate, not flattened seeds. It contains three Australian species. The third section, which may be considered typical of the genus, has short staminal claws, few, pendulous ovules, and the seeds sometimes but not always winged. It contains 10 to 12 species ranging over Australia, New Caledonia, and the Indian archipelago, and includes *Tristaniopsis* of Brongniart and Gris. These distinguished botanists, whose observations on, and descriptions of, New-Caledonian plants are most careful and accurate, and whose opinions must carry great weight, insist, in a supplementary article (Ann. Sc. Nat. Par. ser. 5, vi. 264), on the maintenance of *Tristaniopsis*, relying chiefly on the above-mentioned differences in the ovules and seeds. In this instance, however, we must still think that the two groups are much more appropriately treated as sections than as genera. Although we know of no genus amongst Myrtaceæ which contains at once species with few ascending and others with few descending ovules, yet *Leptospermum* and *Kunzea* are examples of natural genera in which the ovules, as in *Tristania*, are in one section few and pendulous, and in another numerous, crowded, and mostly horizontal; so in *Melaleuca* they are in some species few and ascending, in others numerous, crowded, and horizontal; and in none of these cases, any more than in *Tristania*, do these characters mark groups which we should consider sufficiently natural to be raised to the rank of genera. The winged seeds of *Tristaniopsis* are not constant in the Australian species.

Then follow six genera with opposite leaves, free stamens, and the ovules erect or ascending, unless when very numerous and horizontal—genera which might perhaps with more propriety be reduced to sections of *Metrosideros*, had there been sufficient real advantage to compensate the disturbance of existing nomenclature. These are:—1. SYNCARPIA, Ten., two Australian species now characterized by the capitate inflorescence. It was originally founded by Tenore under the name of *Syncarpia*, and nearly at the same time by Nees under that of *Kamptzia*, for the old *Metrosideros glomerata*, Sm., in which the calyces are connate and the ovules very numerous; to this F. Mueller has since added his *S. leptopetala*, in which the flowers are free, though capitate, and the ovules solitary in each cell, and erect, which characters, with

some minor ones, might have constituted quite as good a monotypic genus as any of those separated from *Metrosideros*. 2. Lysicarpus, F. Muell., another single Australian species, the *Tristania angustifolia*, Hook., referred to the latter genus on account of the stamens being slightly interrupted opposite to the sepals, and thus showing an approach to the section *Neriophyllum* of *Tristania*, but really much nearer to *Metrosideros*, differing in habit and in the polygamous flowers, the outer stamens of the hermaphrodite ones bearing moreover abortive reniform anthers. 3. Cloezia, Brongn. and Gris, to which are probably referable *Mooria* and *Ballardia* of Montrouzier, and comprising several New-Caledonian species, only differing from *Metrosideros* in the shorter stamens, fewer ovules, and more basal placentation. 4. Tepualia, Griseb., a single Chilian species, removed from *Metrosideros* on account of its habit, inflorescence, and geographical station, with the few ovules and basal placentation of the preceding genera. 5. Spermolepis, Brongn. and Gris, comprising two New Caledonian species unknown to me. Besides the 4-merous not 5-merous flowers, the seeds are described as solitary by abortion, bearing near the hilum a kind of involucre or ring of six membranous scales—a most remarkable anomaly, unless it should prove that these scales are abortive ovules adhering to the perfect seed. 6. Nania, Miq., comprising one Malayan and one Australian species, which we have restored to *Metrosideros* as a section, as being more generally known under that genus, and scarcely differing, except in the broad flat, not linear-cuneate seed.

Metrosideros, Banks, was long the repository for all capsular Myrtaceæ with numerous free exserted stamens, and as now limited, besides the two *Naniæ* and a rather anomalous species from South Africa, contains a considerable number of forms ranging over the Pacific, from New Zealand and New Caledonia to the Sandwich Islands, some of them very variable in foliage and indumentum, and exceedingly difficult to distribute into well-defined species. All are distinguished from the neighbouring genera, chiefly by the numerous ovules covering the whole surface of the peltate or laterally adnate placenta. Some of the species differ considerably from each other in the ovary, wholly inferior or more or less of the upper portion free, sometimes after flowering remaining adnate only by the broad base.

Xanthostemon, F. Muell., was first proposed for a North-Australian tree or shrub, remarkable for its long, erect, somewhat rigid stamens, with peculiar anthers, and differing also from

Metrosideros in its alternate leaves. To this he afterwards added the opposite-leaved species, which proves to be a congener of Miquel's *Nania*. Finding more recently that the character common to these two would also apply to the typical *Metrosideros*, he, in describing an additional alternate-leaved species, reunited the whole with the latter genus. In the meantime Brongniart and Gris, in describing New-Caledonian Myrtaceæ, had established their genus *Fremya*, which must include the two genuine species of alternate-leaved Xanthostemons. In retaining the genus the laws of priority compel us to adopt F. Mueller's name, but with the much more definite characters given by Brongniart and Gris, the most important of which, besides the habit, is the insertion of the ovules in a ring round the margin or base of a peltate or clavate placenta. *Draparnaudia* of Montrouzier is probably a species of the same genus.

Backhousia, Harv. & Hook., with four species, and Osbornia, F. Muell., with a single species, all Australian, are placed at the end of the tribe, as connecting it with Myrteæ; for the fruit, apparently dry and hard as in Leptospermeæ, is indehiscent as in Myrteæ, or separates into indehiscent cocci. As genera they are both of them very distinct by a variety of characters.

Tribe III. Myrteæ.

This vast tribe, with uniformly opposite dotted leaves, and characterized by the succulent indehiscent fruit, is, with very few exceptions, limited to tropical or subtropical regions, extending over both the new and the old world. With almost a few exceptions, there is so little definiteness in the floral or carpological differences exhibited by their numerous species, that their distribution into genera is exceedingly difficult, and has become to a great extent arbitrary. After deducting a few monotypic or very small genera presenting more positive abnormal though perhaps artificial characters, the whole of the twelve or thirteen hundred species now known might be almost equally well united into a single genus *Myrtus*, or distributed into the four old genera *Psidium*, *Calyptranthes*, *Myrtus*, and *Eugenia*, as dispersed in the 60 or 70 genera proposed by Blume, O. Berg, and others, or reduced to 18 to 20 as in our 'Genera Plantarum.' In thus rejecting so large a proportion, especially of the South-American genera proposed by Berg, it is not that we do not appreciate his zealous labours in wading through the chaos presented by the innumerable forms preserved in herbaria, nor that we deny that

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the great genera we have adopted may yet be satisfactorily divided into subordinate groups, but we think that in this process he has not met with more success than his predecessors. In attempting to determine species by his work it has appeared to me that the divisions he proposes are not natural enough to enable us to sort the specimens approximatively without examination; and at the same time, if taken as artificial sections, their characters (beyond the embryo, which is so rarely to be met with) are too vague and undefined to serve for practical purposes. We think therefore that the classification of the South-American species of *Campomanesia*, *Psidium*, *Myrtus*, *Myrcia*, *Marlieria*, *Calyptranthes*, and *Eugenia* is a labour to be entirely recommenced when a botanist shall be found courageous enough to undertake so tedious a task.

The first genus we have adopted, Feijoa, Berg (first described by him under the name of *Orthostemon*, which proved to be preoccupied by a Gentianous genus of Brown's), is a single Brazilian species, with something of the aspect of *Psidium*, but remarkable for its thickish filaments, all, or at least the outer ones, erect in the bud. That character alone would not, indeed, be necessarily more than specific; for we know that in *Eucalyptus*, for instance, although it distinguishes *Cornutæ* as a section, it is specific only in *E. marginata* and not even that in *E. tereticornis* and *E. Oldfieldii*. In *Feijoa*, however, the seed, according to Berg, has the embryo imbedded in albumen, which, as far as hitherto known, is absolutely exceptional in the Order. Berg has therefore proposed it as a distinct subtribe of Myrteæ. We know, however, that in Leguminosæ, Rosaceæ, and other typically exalbuminous orders the occasional presence of albumen is no more than generic, and even then often separates species which are otherwise very closely allied. Our specimens of *Feijoa* have no ripe fruit, and Berg does not figure the seed, so that we do not know what is the proportion of albumen present, nor can we conclude that it is always absent in the nearest allied genera until the seeds of more of the species shall have been observed; we have therefore retained *Feijoa*, but as a genus only.

Campomanesia, Ruiz and Pav., was originally distinguished by the authors from *Psidium* by the few large seeds arranged in a single series round the central fleshy axis, to which Kunth added that of the increased number of cells to the ovary. De Candolle, having no specimens, had no means of verifying these characters, which have broken down when applied to the numerous species now known. Berg has supplied several others, which, although

none of them appear to be absolute, may yet, taken together, be allowed to separate two groups which we retain as the genera *Campomanesia* and *Psidium*, each with about 100 species, according to Berg's views (probably reducible by one half), distributed by him, the one into five, the other into three genera. The first of these characters brought forward by Berg, the embryo "spiralis, 2–3-cyclicus" in the *Campomanesia* group, only "uncinato-curvatus, subspiralis v. semiannularis" in *Psidium* and adjoining genera, is, perhaps, the least to be relied on. Independently of the numerous species where the embryo is unknown, if we look at the seeds figured by Berg in the 'Flora Brasiliensis,' t. 53 (*Britoa*) and t. 42 (*Psidium*), we should surely call the embryo in both uncinato-curvatus, and certainly not 2–3-cyclicus in the *Britoa* as it ought to be; and other equally contradictory instances occur in species not figured. It is probable, however, that in most species the seeds have a thinner testa and a longer radicle in proportion to the cotyledons in *Campomanesia* than in *Psidium*; the calyx-limb is less frequently produced below the lobes so as to split in enlarging; the ovary-cells are usually, but not always, 6 or more in the former, only 4 or 5 in the latter; and the most constant distinction given by Berg, as far as I have had occasion to verify it, is the arrangement of the ovules in 2 rows (or very rarely in 4) in each cell, whilst in *Psidium* they are more irregularly crowded. The species of *Campomanesia* are all American.

We propose reuniting with *Campomanesia* four of Berg's genera:—1. *Abbevillea* contains several species, correctly separated from *Psidium* on account of the arrangement of the ovules and the structure of the seeds (where known) agreeing with *Campomanesia*, from which he only appears to distinguish it by the calyx-limb, more or less developed below the lòbes; but in this respect I cannot trace the difference between several species of *Abbevillea* (e. g. *A. Guaviroba*, Berg) and others of *Campomanesia* (e. g. *C. lineatifolia*, Berg). 2. *Acrandra*, which has the connectivum of the anthers produced into a very short point—a single character unaccompanied by any other difference in habit or structure. 3. *Britoa*, with an ample calyx-limb almost closed, with very small lobes in the bud, but afterwards splitting as in the majority of *Psidia*; but this character, though generally good, affords too many gradations in *Psidium* itself to be taken as generic when unaccompanied by any other. 4. *Lacerdæa*, at first distinguished from *Britoa* and *Campomanesia* by the calyx-lobes free from the base as in the latter genus but coriaceous as in the former. The

author, however, subsequently (Linnæa, xxx. 713) acknowledged that *Lacerdæa* was not really distinct from *Britoa*.

Paivæa, Berg, is founded on a single Brazilian species, with the habit and general character, as far as known, of *Campomanesia*, but with the calyx-limb remarkably dilated at the base into five protuberances, very prominent in the bud. It is doubtful whether this peculiarity is of any more than specific value; but as the ripe fruit and seed are as yet unknown, and as the ovary requires further investigation in more advanced specimens, we have retained the genus until its real place shall be ascertained by the examination of the embryo.

Psidium, Linn., a large American genus, of which one or two species have been long in cultivation in most tropical regions under the name of *Guava*, has been generally distinguished from *Myrtus* and *Eugenia* by the valvate calyx, the 4- or 5-celled ovary, and numerous small seeds. The first character, however, which is still the principal one to separate it from *Myrtus*, is to a certain degree a mistake; the real calyx-lobes, when developed, are, as in all other Myrteæ, imbricate in the bud; but they are very small or even entirely abortive, and the undivided part of the limb, closed over the petals and stamens in the bud, instead of dilating as the flower opens as in *Myrtus* and *Eugenia*, or becoming circumsciss round the base as in *Calyptranthes* and *Acicalyptus*, splits longitudinally or bursts irregularly and remains persistent, the parts having but rarely any regular relation to the number of sepals. The 4- or 5-celled ovary is also a general character, but not quite constant, a few species having the number reduced to 2 or 3, as in *Myrtus*; the number and size of the seeds is much more variable than at first supposed. The embryo is that of *Myrtus*, the habit somewhat different. The distinction from *Campomanesia* has been already noticed.

We propose reuniting with *Psidium* two of Berg's genera:—1. *Acca*, a single Peruvian species (the two established by Berg, chiefly on geographical grounds, prove to have both the same origin), was indicated by DeCandolle as a genus distinct from *Eugenia*, under which it had been published; but I can discover nothing in habit or character to separate it from *Psidium*. 2. *Calyptropsidium* is a Guatemalan species, which is unknown to us, except from Berg's description. By this it appears only to differ from *Psidium* in that the calyx-limb, besides splitting longitudinally, is at length more or less circumsciss at the base.

Psidiopsis, Berg, and Calycolpus, Berg, are two small genera,

the first monotypic, the second of very few species, connecting, as it were, *Psidium* with *Myrtus*, but retained in order the better to draw the line between those large genera. Both have usually the 4- or 5-celled ovary and the ovules of *Psidium*, but the bud is crowned with large leafy calyx-lobes; in *Psidiopsis* the calyx-limb splits below these lobes as in *Psidium*; in *Calycolpus* it is either not developed below the lobes or is very short and expands without splitting as in *Myrtus*; and in one species, *C. calophyllus*, Berg, these lobes are scarcely foliaceous. The embryo is unknown in *Psidiopsis*; in *Calycolpus* it is like that of *Psidium* and *Myrtus*. The habit of both is nearly that of *Psidium*, although in *Calycolpus* it may sometimes be thought to come nearer to that of the section *Ugni* of *Myrtus*.

Rhodomyrtus, DC., was originally proposed, as either a section of *Myrtus* or a distinct genus, for the pink-flowered *M. tomentosa*, remarkable for its triplinerved leaves like those of Malastomaceæ. This, however, which was believed to be the principal character, was ultimately not thought by DeCandolle to be of higher than sectional value, notwithstanding some differences observed in the arrangement of the ovules and the supposed increased number of cells. But the recent addition of four Australian species, and a careful study of the ovary and fruit, have since pointed out other characters which, together with the habit, nearer to that of *Psidium* than of *Myrtus*, have induced us to adopt *Rhodomyrtus* as a genus. The venation of the leaves has not proved constant; for of the five species two only are triplinerved, one is penninerved, and the remaining two show an intramarginal vein, more or less incomplete or perfect, so as to form the passage from the one to the other. The ovary is, as in *Myrtus*, 2- or 3-carpellary, or in one species reduced to a single carpel; but the ovules are superposed in two long rows in each carpel, with a longitudinal spurious septum between the rows, so as, on a transverse section, to give the appearance of twice as many cells as carpels; besides which, spurious transverse septa, like those of *Timonius* (or *Nelitris*, Gærtn.) in Rubiaceæ, separate each seed—a circumstance not hitherto observed in any other Myrtacea, its having been indicated in *Decaspermum* (*Nelitris*, Lindl.) being, as I shall presently have to point out, erroneous.

The typical genus Myrtus is the one to which it is perhaps the most difficult to assign its proper limits. Originally distinguished from *Eugenia* by the fruit, evidently 2- or 3-celled, instead of apparently 1-celled (the structure of the ovary being

at that time disregarded), it was, after the reformation of the tribe founded on embryonic characters, limited by DeCandolle to the species with few seeds, a bony testa, and horseshoe embryo, always supposed to be accompanied by 5-merous flowers; and numerous 4-merous, especially Chilian, species, of which the seed was unknown, were transferred to *Eugenia*. The greater number of these, however, have since proved to have the seed and embryo of *Myrtus*, or nearly so, and have either been restored as sections of *Myrtus*, or raised into distinct but closely allied genera, thus forming a group, distinguished from *Campomanesia* and *Psidium* by the ovary never more than 3-celled, and from the latter by the form of the embryo-limb and generally by the habit, from *Myrcia*, *Marlieria*, and *Calyptranthes* by the ovules always more than two in each cell, from *Eugenia* by the embryo only as a positive character, with occasional collateral aids from inflorescence and habit, and from various smaller genera by the absence of the exceptional characters which have severally induced their separation. It is the group thus (perhaps still somewhat vaguely) limited that we have adopted as the genus *Myrtus*, reducing to sections some tolerably distinct subordinate groups established by A. Gray and others. If I observe that the generic limits are still somewhat uncertain, it is because the number of cells of the ovary, although perhaps never more than three in *Myrtus*, except in a few abnormally exceptional flowers, is nevertheless sometimes, although rarely, reduced to two or three in *Psidium*; and the embryo in a very few species has so thick and little curved a radicle, and the cotyledons so very small, that it may be mistaken for the apparently homogeneous embryo of *Eugenia*, not to speak of the numerous species of which the embryo is as yet unknown.

Eight or nine genera have been proposed to be dismembered from the American *Myrti*, some of which form excellent sections, which we might even have adopted as genera, had it not been for some Australian, and even a few American, species, which tend to invalidate their artificial characters, whilst there is little or nothing to render them really natural divisions. These are:—

1. *Ugni*, proposed by Turczaninow for those Chilian and Andine species which, on account of their 4-merous flowers (the embryo being then unknown), had been referred by DeCandolle to *Eugenia*. They have, moreover, the calyx-lobes spreading in the bud, and the erect anthers of *Calycolpus* and other Psidioid genera. This is thus the most distinct of all the subordinate groups, and we hesitated much whether we should not admit it as a substantive genus;

but the habit, the 1-flowered peduncles, the ovary, and the seeds are so decidedly those of the typical European *Myrtus*, that we have followed A. Gray in reuniting it as a section.

2. *Eumyrtus*, or the genus *Myrtus* as limited by Berg. Besides our own European Myrtle, this includes a considerable number of extratropical and Andine South-American species; they are all 5-merous, the peduncles are 1-flowered, or very rarely 3-flowered, the anthers are versatile, and the seeds, as far as known, have always a hard testa, a long curved but not spirally rolled embryo, with very small colytedons.

3. *Leantria*, a sectional name taken up by A. Gray from a proposed generic name of Solander's quoted by Forster, is the group established by Berg as his genus *Myrteola*. It contains about ten species from Andine and extratropical South America, which have either the habit of *Eumyrtus* or are smaller and more prostrate, and have also its characters, except that the dissepiment of the ovary is incomplete, not reaching the top of the cavity.

4. *Luma* was proposed by A. Gray as a genus under that name, and by Berg under that of *Myrceeugenia*, for several species, chiefly Andine or Chilian, which, like the *Ugnis*, had, whilst their seeds were unknown, been referred to *Eugenia* on account of their 4-merous flowers. They have nearly the habit of *Eumyrtus*, but have frequently three to seven flowers on the peduncles; and the seeds show more or less of an approximation to those of *Myrcia*; the testa is thin; and the colytedons, larger in proportion to the radicle than in *Eumyrtus* and *Ugni*, vary from one species to another, narrow or broad, long or short, flat or more or less folded. It was, on observing this great diversity from species to species, and the combination of the thin testa and small cotyledons in *Temu* and *Blepharocalyx* of Berg, that we were prevented from following A. Gray in adopting the genus *Luma*, which, as a section, rests solely on the texture of the testa; and that character even is invalidated by at least one Australian species.

The following South-American Myrtoid groups had not come under A. Gray's observation:—1. *Temu*, Berg, a genus proposed for one or two Chilian species, with the flowers and thin testa of *Luma*, but with the small cotyledons of *Eumyrtus*, thus closely connecting the two sections. 2. *Anamomis*, Griseb., established on three West-Indian species, which appear to me, in every respect, to come within the section *Luma*, with which it did not occur to Grisebach to compare them. 3. *Blepharocalyx*, Berg,

a few South-American, chiefly Brazilian species, which, like *Temu*, have the flowers and thin testa of *Luma*, but differ slightly in the deciduous calyx-lobes.

4. *Pseudocaryophyllus*, Berg, containing several South-American species (including some of Kunth's *Myrti*), which, on account of their larger, more coriaceous leaves, and tetramerous flowers, have been referred by recent authors to *Eugenia*; some of them, of which he had not seen the fruit, are even still placed there by Berg. They prove, however, to have the ovary and seeds of *Myrtus*, but differ from all the above-mentioned sections in their numerous flowers in trichotomous cymes.

5. *Myrcianthes*, Berg, is made up of four species, of which two have furnished the generic character—*M. cisplatensis*, Berg (*Eugenia*, Camb.), and *M. apiculata*, Berg. These appear to me to be truly referable to the section *Luma*. Berg characterizes them chiefly by the embryo with thick plano-convex cotyledons, an exserted radicle, and a well-developed plumula enclosed between the cotyledons—that is, nearly the embryo of *Eugenia*, except that in that genus the radicle, when elongated, is turned in against or between the cotyledons; and the development of the plumula is so anomalous in the order, that one would be unwilling to admit it without repeated verification. The habit also is entirely that of the several-flowered *Myrti*, and very different from that of *Eugenia*. Unfortunately our specimens of all the species are in flower only, and we have no seed to examine; but, judging from the figure in the 'Flora Brasiliensis,' t. 32, we should conjecture that the so-called cotyledons may possibly be a very thick radicle folded on itself, such as we have found it in some of the *Blepharocalyx* group, and such as is described by Lindley, in Paxt. Fl. Gard. iii. 149, in *Eugenia apiculata*, DC., a true *Luma*, and that the supposed plumula consists merely of the small inflected cotyledons. Of the two remaining species, *M. brunnea*, Berg, of which the fruit is unknown, is probably a *Myrtus*; *M. edulis*, Berg, of which the plumula is not mentioned, may be a *Eugenia*.

Of the nine Australian species of *Myrtus* four have the 5-merous flowers, hard testa, and small cotyledons of *Eumyrtus*; but in three of them the embryo is very much longer and spirally involute, as in the *Campomanesia* group; two, also 5-merous, have the small cotyledons of *Eumyrtus*, the spirally involute embryo of *Campomanesia*, but with a testa approaching more nearly to that of *Luma*, being of a rather thin consistence and remarkably granular rugose, and one of them has the dissepiment incomplete as in

Leantria. In the three remaining species, two of them 5-merous and the third 4-merous, the seed is unknown.

It is on account of the above complications, the want of correspondence between the number of parts of the floral envelopes, the consistence of the testa, the comparative size and shape of the cotyledons and radicle, and the degree of development of the inflorescence, that we have proposed to include the whole of the above group in one genus, *Myrtus*. It is probable that when the seeds of most of the doubtful species shall become known, five or six tolerably well-marked American sections may be formed, including *Pseudocaryophyllus*, and perhaps *Blepharocalyx*, referring *Temu*, *Anamomis*, and *Myrcianthes* to *Luma*, and placing the Australian ones in two or three separate sections.

There remains the genus *Macropsidium* of Blume, unknown to us, but referred by Miquel to *Psidium*, and which in the 'Genera' we thought showed all the characters of *Myrtus*. In either case the geographical station, the island of Gilolo in the Moluccas, would be quite exceptional. On restudying Blume's character, it has occurred to me that the 4-celled ovary, with numerous uniseriate ovules, may be in fact a 2-celled ovary divided by longitudinal spurious dissepiments, in which case the plant would be referable to *Rhodomyrtus*, a genus already known in the archipelago. Blume's second species is conjectural only, founded on Loureiro's description of his *Psidium rubrum*.

Rhodamnia, Jack (with which *Monoxora*, Wight, has proved to be identical), is one of the most distinct genera amongst Eumyrteæ, and, as far as hitherto known, presents no ambiguity. There are about a dozen species, from tropical Asia and Australia, with the three-nerved or triplinerved leaves (which are, besides, only known in Myrtaceæ in a few species of *Rhodomyrtus*), the inflorescence and 4-merous flowers of the typical American Eugenias, and the seeds and embryo of *Myrtus*, but which are absolutely exceptional in Eumyrteæ by their ovary 1-celled, with two parietal placenta, without any trace of dissepiment.

Fenzlia, Endl., is also exceptional, but is almost monotypic, consisting only of two tropical or subtropical Australian species, closely allied to each other. The ovary is reduced to two or to a single carpel, as in some species of *Rhodomyrtus*; and the ovules, very few in number, are superposed, as in that genus, but in a single row. The habit and inflorescence show an approach to *Osbornia* in Leptospermeæ; the fruit, a 1- or 2-seeded drupe, with a bony endocarp and thin almost dry exocarp, is also very near

to what is believed to be that of *Osbornia.* The seed and embryo are nearly those of some Australian *Myrti*, the testa thin, the radicle very long and much coiled round the linear cotyledons.

DECASPERMUM, Forst., is the name which ought to have been adopted for the small genus which stands in our 'Genera Plantarum' as *Nelitris*, Gærtn. In this we had followed Lindley, De Candolle, and other modern botanists, not suspecting that their identification of Gærtner's genus was erroneous. We had, unfortunately, overlooked the fact that Thwaites (Enum. Pl. Zeyl. 153) had ascertained that Gærtner's plant belongs to the Rubiaceous genus now known under the name of *Timonius*, Rumph. A careful study of Gærtner's description of the fruit would, indeed, have shown that it could not be that of *Decaspermum*; but what probably originally led to the error is, that he expressly describes the seed as exalbuminous, and it was not until A. Gray's careful review of the Guettardeæ that it was observed that the albumen was wanting in *Timonius*, or, indeed, that it was supposed that it ever was deficient in any Rubiacea. For the Myrtaceous genus we must therefore have recourse to Forster's name, although far from appropriate. It consists of very few species, from eastern tropical Asia and tropical Australia, nearly allied to *Myrtus*. They have the hard testa and the embryo of the section *Eumyrtus*; but the inflorescence is racemose, as in some American *Eugeniæ*, never cymose as in the many-flowered *Myrti*; the ovary is 4- or 5-celled, whilst it is only 2- or 3-celled in *Myrtus*; and the ovules, 2 or 3 in each cell, or very rarely more, show an approach rather to *Myrcia* than to *Myrtus*.

MYRCIA, DC., is a very large tropical and subtropical American genus, allied to *Myrtus*, but originally separated on account of the embryo, which, in the few seeds then known, showed large broad cotyledons, more or less folded. Now that many more seeds have been examined this character proves to be not near so constant as had been supposed; the embryo often varies from species to species, and in some of the section *Luma* of *Myrtus* it is very much like that of some species of *Myrcia*; and it is probable that if the seeds of all were known the connexion would be found still closer. The genus may, however, be retained; for, besides the inflorescence, which is usually more compound, there appears to be a more constant difference, in the ovary containing only 2 collateral ovules in each cell. The cells are usually 2, or rarely 3, and the flowers almost always 5-merous, as in the section *Eumyrtus*. The 500 supposed species of *Myrcia* may probably

be reduced to 300; but this is still a very large number, rendering the task of grouping exceedingly difficult when there is so very little in their characters of absolute difference definable in words. Berg has, indeed, proposed to separate five genera upon modifications of the calyx-limb and anthers; but in going through a considerable number of species, these differences have frequently appeared to us so difficult to appreciate, and so little in accordance with habit, that we cannot but agree with Grisebach in reuniting them all with *Myrcia*. The division of this overgrown genus into good sections must be the work of renewed and patient investigation. The Bergian genera are :—

1. *Myrcia*, which he limits to 188 species, with the stamens inserted immediately round the margin of the ovary, without any development of the calyx-limb below them.

2. *Aulomyrcia*, of which he enumerates 251 species, distinguished by the calyx-tube being more or less evidently produced between the margin of the ovary and the insertion of the stamens. This character is sometimes very prominent; but in other cases it is very difficult to say whether the interval is perceptible or not. Its uncertainty will indeed be manifest by a glance at Berg's analysis of *Aulomyrcia obovata*, Berg, Fl. Bras. Myrt. t. 19, which is said to have "Hypanthium supra germen valde productum," and of *Myrceeugenia myrtoides*, Berg, *l. c.* t. 25, which ought to have "Hypanthium supra germen haud productum."

3. *Calyptromyrcia*, 9 species, with the calyx-tube produced below the stamens, as in *Aulomyrcia*, but the limb less deeply divided above them, showing an approach to *Marlieria*. The outermost petal is also much larger than the others; but this irregularity occurs also in other *Myrciæ*.

4. *Gomidezia*, 48 species, with the calyx of *Aulomyrcia*, but with larger anthers, the cells opening by a shorter and more oblique slit, and one of them often placed higher up than the other.

5. *Cerquieria*, a single species, very much like several *Gomideziæ* of Berg's group of *Magnifoliæ*, but in which the anthers are said to be 4-celled, opening in as many terminal pores. This, however, seems to be a delusion, arising from the anthers having opened already in the bud, and the margins of the slits being closely involute, so as apparently to divide the cells. It must be recollected also that, in the majority of Myrtaceæ as in other plants with so-called 2-celled anthers, each cell before opening is more or less completely divided by a longitudinal septum opposite to the line of dehiscence.

6. *Calycampe*, 2 Guiana species, only differing from *Myrcia* proper in the calyx-lobes being separated by broader sinuses.

MARLIERIA, Camb., is another American tropical and subtropical genus, with the biovulate ovary-cells and inflorescence of *Myrcia* and *Calyptranthes*, but with the calyx-limb quite closed over the petals in the bud, or only with minute lobes at the tops, and splitting valvately as the flower opens, as in *Psidium*. Berg enumerates 57 species (probably reducible to about 30), which he distributes in three genera, *Marlieria*, *Rubachia*, and *Eugeniopsis*, according to whether the calyx-limb is quite closed in the bud or shows 4 or 5 very small imbricate lobes. The petals are sometimes reduced or wanting as in *Calyptranthes*.

CALYPTRANTHES, Swartz, like *Marlieria*, has the ovary and seed of *Myrcia*, but is distinguished by the calyx; its limb is entire and closed over the petals in the bud as in *Marlieria*, but, instead of splitting longitudinally as the flower opens, it falls off in a single operculum, circumsciss at the base. The petals also, as in several *Marlieriæ*, are reduced to a very small size, or altogether wanting. Berg enumerates 73 species, all from tropical America. Among them we have temporarily included *Mitranthes*, Berg, a small group (8 species, according to Berg) differing from the typical *Calyptranthes* in their more numerous ovules. The ripe seed is unknown. Berg conjectures it to be that of *Eugenia*; the immature one which I was able to examine in *M. Gardneriana*, Berg, seemed to me to be rather that of the *Myrtus* group. Should this prove to be really the case, *Mitranthes* would, we think, most conveniently rank as a section of *Calyptranthes*. If, on the other hand, it has the embryo of *Eugenia*, we should probably, notwithstanding the difference of country, have to regard it, with *Acicalyptus*, as a section of *Eugenia*, or as an adjoining genus.

PIMENTA, Lindl., consists of very few species (5 according to Berg), from tropical America, one of them much cultivated in various tropical countries under the name of *Pimento* or *Allspice*, whence the generic name, although very different from the plants so generally known on the continent of Europe under the name *Piment*, which are all species or varieties of *Capsicum*. The Myrtaceous *Pimenta* has the habit, inflorescence, and embryo of the *Pseudocaryophyllus* group of *Myrtus*, but is very different in the structure of the ovary; the ovules, few in number (1 to 4 or perhaps, 6 in each cell) are attached to a placenta suspended from the apex of the cavity, whilst in all the great Myrtoid genera the placenta is adnate to the centre of the dissepiment or to the inner

angle of the cells. Berg proposes to limit the genus to the single *P. communis*, Lindl. (*P. officinalis*, Berg), which has 4-merous flowers and a spirally involute embryo of 2 or 3 coils, whilst the other species, which he separates under the name of *Amomis*, have 5-merous flowers and a much less involute embryo; but as we have not admitted these characters as sufficient in *Myrtus*, where the large number of species show their want of conformity with habit and other characters, so can we much less agree to their separating in this instance a single species without any difference in habit. We have found the embryo of *Pimenta acris* (*Amomis acris*, Berg) intermediate between that of *P. communis* and the other species of *Amomis* of Berg.

MYRRHINIUM, Schott, independently published also as *Feliciana* by Cambessèdes, and as *Tetrastemon* by Hooker, is a single species, widely spread in South America, which at first sight appeared so anomalous as to have been placed with some Melastomaceæ in the now abandoned order of Memecyleæ. The stamens were supposed to be definite; but, although very few in number, they vary from four to eight; they are not in a single series, and are not placed in any regular position as to their alternation with sepals or petals, thus showing all the characteristics of indefinite stamens. The long straight filaments (which give them a peculiar aspect) are those of *Xanthostemon*, of *Feijoa*, or of *Eucalyptus cornuta* and its allies. *Myrrhinium* has also numerous ovules, placed on the margin of a bilamellate placenta, which is rare in the tribe, but occurs in a few species of *Myrtus*, and is moreover an arrangement strictly analogous to that of the ovules of *Bæckea* and *Xanthostemon*, which are inserted in a ring round the margin of a dilated placenta. The embryo of *Myrrhinium* is apparently homogeneous; so that it is as yet doubtful whether it consists of a radicle with minute or abortive cotyledons as in some species which we include in *Myrtus*, or whether the cotyledons are conferruminate as in *Eugenia*—a point that can only be settled by watching its germination.

EUGENIA, Linn., is at once the largest and the widest-spread genus of the Order, and the one which has occasioned the greatest diversity of opinion as to its delimitation. Above 700 species are described, which a careful scrutiny might reduce to about 500; and whilst several eminent botanists, whose example we have followed, retain the genus in its integrity, others of equal ability have distributed the species into six or into ten genera, and others, again, have endeavoured to establish nineteen, besides two or three which we have adopted, but will perhaps ultimately be likewise

reduced to *Eugenia*. The species are most extensively distributed over tropical and subtropical America and Asia, with a much smaller number in tropical and subtropical Australia and Africa; and a very few of them are cultivated for their edible fruits or for their flower-buds used as spices.

The chief character connecting this vast group lies in the embryo, which is thick and fleshy, sometimes apparently homogeneous, but in most cases showing more or less distinctly two large thick cotyledons and an exceedingly short radicle. In other respects the embryo varies in shape, straight or somewhat curved; the two cotyledons are equal and hemispherical, or unequal and irregularly shaped, closely united or separable or quite distinct. The great difficulty, however, has been to find accompanying characters independent of the embryo, which is so seldom procurable, either in wild or cultivated specimens; for the 2-celled ovary with several ovules in each cell, the small stigma, and the stamens are quite those of *Myrtus*. The flowers of *Eugenia* are almost always 4-merous, and this was at one time thought to be a safe character to rely upon; but, as already observed, several South-American species, which on this account were transferred from *Myrtus* to *Eugenia*, had, when their embryo became known, to be restored to the former genus, of which, indeed, they have the habit. A very few species, moreover, of true *Eugeniæ* are exceptionally 5-merous; and in some, especially Asiatic ones, owing to the petal-like nature of the inner calyx-lobes, or to the abortion or consolidation of some or of all the petals, it is not easy to say what is their real number. Inflorescence, as pointed out by Grisebach, is an excellent indication for the majority of the American species. There are no secondary cymes in the *Eugeniæ* of that continent. When the flowers are clustered or paniculate in the axils it is from the contraction or development of leafless flowering branches ramified like the leafy ones; whilst in *Myrtus* and *Myrcia* the secondary cymose inflorescence, if not developed, is generally indicated by the opposite bracteoles under the calyx. But this collateral character fails entirely for the Asiatic species, the great majority of which have a trichotomous cymose inflorescence. Here, however, there is no practical difficulty, as there are no true *Myrti* known from tropical Asia. Australia has, like South America, several species of both genera, and like tropical Asia has both the inflorescences of *Eugenia*; but all the Australian *Eugeniæ* are 4-merous, and the *Myrti* 5-merous, except *M. fragrantissima*, F. Muell., which has every appearance of being a 4-merous *Myrtus*, but remains doubtful as the seed is unknown.

In the subdivision of this overgrown genus we have again followed Grisebach in attaching primary importance to inflorescence, although we cannot go so far as to give it generic value, which would necessitate the removal into *Jambosa* of nearly the whole of the Asiatic Eugenias, thus disturbing the nomenclature sanctioned by Wight, A. Gray, and others, without adequate advantage. There is no concomitant difference in the flowers or foliage; and after all, where the secondary inflorescence remains undeveloped (where the flowers are solitary in the axils) the character it supplies becomes almost theoretical, to be judged of chiefly by analogy or by geographical circumstances. We have in the next place adopted the distinction pointed out by De Candolle, the separate expansion of the petals in *Eugenia* proper and *Jambosa*, and their cohering and falling off together in *Syzygium*; but this distinction is far from being so absolute as was supposed when it was taken for the generic character of *Syzygium*, and requires supplementing by other considerations. In the *Jambosa* section the calyx-tube is rather more constantly produced between the ovary and the insertion of the stamens; and the limb above the stamens is distinctly divided into four usually persistent lobes; and the petals always expand and fall off separately. In *Syzygium* the interval between the ovary and the stamens is not always conspicuous, the calyx-limb is usually truncate or sinuate and obscurely lobed, or the lobes are deciduous, and the petals in most species are more or less coherent or very small, or altogether wanting. Where in either case one of the characters fails, it may be supplemented by the other. The habit presents in both groups nearly the same variations, which may serve for their further subdivision.

We shall thus have three great sections or subgenera:—*Jambosa* and *Syzygium*, each with about 60 (reduced from 80 or 90) Asiatic, Australian, and African species, and *Eugenia* proper (*Eueugenia*, Wight, or *Eugeniastrum*, Griseb.), with between 300 and 400 American species, with a few from Africa, Australia, and Asia. To these sections may, perhaps, be added a fourth, *Myrciaria*, to which I shall presently revert.

The genera which various authors have proposed to dismember from *Eugenia*, and which we would now, after Wight, Grisebach, and others restore to it, are, besides *Syzygium*, the following:—

Caryophyllus, Linn., was very naturally distinguished from *Eugenia* at a time when the few species of the latter genus then known had a short calyx-tube and free expanding petals; whilst

in *Caryophyllus* the long calyx-tube and coherent petals are particularly striking in the buds so well known as the cloves of commerce. And it is perhaps the great difference in the commercial use of the plant that has induced subsequent botanists to endeavour to keep up the genus, even since it has been ascertained how much the form of the calyx-tube varies from species to species. Thus DeCandolle and others have attempted to add a character derived from the stamens in the bud being arranged in four bundles, separated by the indented teeth of the calyx; but this is no more than the impression of the thickened midribs of the sepals, such as may be seen in the buds of other *Eugeniæ* with exceedingly numerous stamens, and disappears as the stamens expand. We therefore cannot but agree with Wight in annexing *Caryophyllus* to the section *Syzygium*, as we would restore to the section *Jambosa* the genera *Strongylocalyx*, Blume, *Clavimyrtus*, Blume, and *Macromyrtus*, Miq., all founded on the form of the calyx-tube, globular in the first, long and club-shaped in the second, still longer in the third.

Jambosa, DC., and *Microjambosa*, Blume, were separated, the former from *Eugenia* as then understood, the latter from *Syzygium*, and *Jambosa* is still kept up by Miquel, on account of the calyx-tube being in all three more or less produced between the ovary and the stamens; but this character has not appeared to us more definite or more conformable to habit in this case than in that of *Aulomyrcia*. In many species of the section *Jambosa* the ovary occupies, it is true, but a very small space in the bottom of the deep calyx-tube; but in others it reaches halfway up, or is so thickly fleshy at the top that it is difficult to say where it ends, and whether it does or not extend to the insertion of the stamens. The difficulty of appreciating this character may be readily seen by a glance at Blume's figures of *Strongylocalyx* and *Gelpkea* (Mus. Bot. t. 54 & 55), both referred by Miquel to the same genus, which ought to have the calyx-lobes divided to the ovary.

Acmena, DC., was founded upon what was supposed to be the *Metrosideros floribunda*, Sm., with a *Syzygium* calyx and fruit, but with 5 very small free petals; but, owing to the imperfect materials he possessed, and the deficiency of authentic specimens, DeCandolle had confounded three very different plants:—1. The true *Metrosideros floribunda* of Smith, with really 5-merous flowers, which has a capsular fruit, and is the *Angophora intermedia*, DC. 2. The plant figured by Ventenat as Smith's *M. floribunda*,

which is a true *Eugenia* of the section *Syzygium* (that is to say, it has the *Syzygium* inflorescence and calyx): this has usually 4 small petals, with the occasional addition of an inner series of still smaller ones; and I have always found them free, and separately deciduous; M. Mueller, however, who has published the species under the name of *Syzygium floribundum*, has observed them to be sometimes coherent: in reducing it, with other *Syzygia*, to *Eugenia*, I have not been able to keep up the specific name of *floribunda*, preoccupied in the larger genus, and I have entered it in the 'Flora Australiensis' under that of *E. Ventenatii*. 3. *Eugenia elliptica*, Sm., which is *Acmena floribunda β. elliptica*, DC., and is in every respect a *Syzygium* with the petals always united in a small flat calyptra. This species, with very much the habit of *E. Ventenatii*, is remarkable for its anthers with divaricate cells—a solitary exception, as far as hitherto observed, in the whole vast genus *Eugenia*, and which in this instance appears to have been overlooked by all botanists except F. Mueller. Here, again, I have been unable to keep up the original specific name, which was preoccupied, and have given it that of *E. Smithii*.

Strongylocalyx, Blume, founded on the shape of the calyx-tube, appears to me to belong to those species of the *Jambosa* section which DeCandolle had placed in *Eugenia* on account of the short broad adnate part of the tube; Miquel now places it in *Eugenia*, though it has the highly developed free part of the calyx-tube characteristic of his *Jambosa*. *Gelpkea*, Blume, is in this respect rather nearer *Eugenia* as understood by Miquel, but was characterized by Blume as having the calyx-lobes strictly valvate. I have seen no specimens; but from Blume's figure I feel convinced that there is here a misapprehension, like that of the same author in his character of *Leptospermum*, and that, although the æstivation is open when the bud is ready to expand, it is imbricate at an earlier stage, at any rate not valvate. Miquel, in referring the species to *Eugenia*, says that the calyx-lobes are separated by a broad sinus.

Eugenia alternifolia, Wight, Ic. t. 537, is remarkable as the only species known in the vast tribe of Eumyrteæ with alternate leaves. It was by some mistake that in the 'Genera Plantarum' we referred to it as a *Jambosa* with a calyptrate calyx: the operculum is formed of the petals; and the species is correctly ranked by Wight in the *Syzygium* section.

Turning now to the genera which we include in the section *Eueugenia*, *Plinia*, Linn., was founded upon the well-known *Eu-*

genia Michelii, Lam., and forms part of the genus *Stenocalyx* proposed by Berg on account of a peculiarity in the inflorescence. The peduncles, 1-flowered, as in *Eueugenia*, appear towards the base of axillary branches, and the lower subtending leaves are reduced to small bracts, the branch becoming leafy without flowers at the end; the inflorescence is thus an axillary raceme growing out into a leafy branch—a very vague character depending on the degree of development of the lower floral leaves. Berg adds to it that the calyx-lobes are longer and narrower than in *Eugenia*; but that only applies to a portion of the species. In *S. laxus*, Berg, and some others, they are broadly ovate. *Phyllocalyx*, Berg, is only distinguished from *Stenocalyx* by the still greater foliaceous expansion of the calyx-lobes. *Hexachlamys*, Berg, is a single species with hexamerous flowers; but we have seen that in many large genera of Myrtaceæ there are species with an exceptional increase or reduction in the number of parts, constant or occasional, without the circumstance being available for a generic character.

Jossinia, Comm., was established by DeCandolle for a few Mascarene species, which he compared to *Myrtus*, believing, from the numerous ovules, that they had probably the seeds of that genus but with the 4-merous flowers of *Eugenia*, stating also that they differ from the latter genus in the broader staminal disk. Blume, however, has since shown that they have entirely the fruit and seeds of *Eugenia*, in which genus also there are several instances of a staminal disk at least as broad as in *Jossinia*, which must now be reduced to the section *Eueugenia*.

Myrciaria, Berg, contains a considerable number of American species, distinguished from *Eueugenia* by the calyx-tube produced above the ovary, as in *Aulomyrcia*, *Jambosa*, &c., and by the ovules, two in each cell (as in *Myrcia*), not several (as in all other *Eugeniæ*). Had these characters been accompanied by any general difference in habit or inflorescence, they might have well served to maintain the genus; but some of the five series under which the species are classed, are more generally different from each other than from corresponding groups of *Eugenia*. The first series, *Dichotomæ*, have the inflorescence of *Myrcia*, and will probably prove to belong to that genus, the fruit of the three species referred to it being at present unknown. The *Paniculatæ* require further elucidation, the fruits of several of them also not having been described. The *Glomeratæ* and *Lateriflora* constitute a more natural group, which we may, with Grisebach,

consider a good section of *Eugenia*, although, in inflorescence, passing into *Eueugenia*.

Siphoneugenia, Berg, has three species, with the calyx-tube produced, as in *Myrciaria*, but with the ovules and inflorescence of *Eueugenia*. *Catinga*, Aubl., has the inflorescence of *Myrciaria*, with the calyx and ovules of *Eueugenia*.

CLEISTOCALYX, Blume, is unknown to me, except from the description and figure of Blume, Mus. Bot. i. 84, t. 56. It is represented in bud only, with detached fruits, which are entirely those of *Eugenia*, to which genus Miquel refers the plant. The figure in bud is that of *Acicalyptus*; but Blume describes the calyx-limb (closed before flowering, as in *Acicalyptus*) as splitting into four or five irregular lobes before it falls, instead of cohering in a circumsciss operculum; this, however, may have been accidental in a single detached calyx, or even conjectural; for, if well ascertained as an essential character, it would have been represented in the figure. Should *Acicalyptus* really prove to have a Eugenioid embryo, it might be united with *Cleistocalyx* in a genus closely allied to *Eugenia*, but differing from its section *Jambosa* (as *Calyptranthes* does from *Myrcia*) by the operculate calyx; and such genus would probably, notwithstanding a slight difference in the placentation, include also *Piliocalyx*, recently proposed by Brongniart and Gris, if the embryo, as yet unknown, should prove to be that of *Eugenia*.

CALYCORECTES, Berg, including *Schizocalyx*, Berg, contains a few American species differing considerably from each other in aspect, but supposed to be all characterized by a Psidium-like calyx with a Eugenioid embryo, thus differing from *Eueugenia* as *Cleistocalyx* does from *Jambosa*. The seed, however, appears to have been examined only in one species; and none of our specimens have ripe fruit; and it is with doubt that we have temporarily retained the genus.

AULACOCARPUS, Berg, comprises two American species, with the habit and inflorescence of the large-leaved *Eueugeniæ* or Catingas. Their flowers are unknown; but the fruits differ from the majority of *Eugenia* in the very hard thick pericarp, separating when dry more or less readily into 1-seeded pyrenes. How far that may take place in any true *Eugenia* we do not know. The fruit of *Eugenia* was originally supposed to be a drupe.

CUPHEANTHUS, Seem., which we had placed amongst genera of doubtful affinity, has been further elucidated by the observations of Brongniart and Gris and by the notes of Vieillard, our

conjecture that *Gaslondia* of the latter botanist was the same genus having proved correct. Messrs. Brongniart and Gris show that it agrees in all respects with *Eugenia* (sect. *Jambosa*), except that the flowers are 3-merous—a character which, I believe, in the whole tribe occurs only in one or two species of *Myrcia*. If, however, it prove constant, it may serve to maintain the genus, although in close proximity to *Eugenia*.

Tribe IV. LECYTHIDEÆ.

The three well-known subtribes Barringtonieæ, Lecythideæ, and Napoleoneæ, which we have thought might well be grouped into a tribe under the name of Lecythideæ, require no comment on the present occasion. We have proposed no alteration in the circumscription of the thirteen genera of which the tribe is composed, the American ones having been well distinguished by Berg, and the Asiatic ones by Blume and others; I have already had occasion to allude to the affinities of *Napoleona* in a note on *Asteranthos*, printed in the third vol. of our Journal; and the curious anomalies in the stamens and staminodia of these two genera will, I believe, be fully discussed in a paper prepared for the Society by Dr. Masters.

A List of the Musci collected by the Rev. THOMAS POWELL in the Samoa or Navigator's Islands. By WILLIAM MITTEN, Esq., A.L.S.

(With two Plates.)

[Read March 7, 1867.]

THE Mosses enumerated in the following pages have been gathered chiefly in the Island of Tutuila. Including a few incomplete specimens, about 100 species have been obtained; with only two or three exceptions, all are from the bark of trees or from decayed wood. As might have been expected, the Samoan Musci manifest a close correspondence with those inhabiting the Figi Islands, and with them approach generally most nearly to the forms which appear especially to belong to the islands of the Indian Archipelago. Conspicuous amongst Mr. Powell's collection are two species of *Spiridens*, generally resembling the original *S. Rienwardtii* of Java, but both more robust—and two species of *Garovaglia*, also closely corresponding with other species found in Java and the Moluccas. Accompanying these, Mr. Powell has found a new genus, in its leaves and habit very nearly resembling the Tropical-American *Helicophyllum*, and another in all respects

corresponding with the smaller forms of *Thuidium*, but having the calyptra of *Hookeria*. Besides these, there are a few barren stems of a Moss either congeneric with the Tropical American *Drepanophyllum* or belonging to some unknown but closely allied genus, a second species of *Calomnion*, and some new forms of *Octoblepharum*.

The numbers appended to the species are those under which the specimens were originally transmitted to Europe and exist in various herbaria.

MACROMITRIUM BEECHEYANUM, sp. n. **Rami elongati, cæspitosi; folia dense inserta, e basi brevi erectiore recurva, patentia, apicibus incurvis, a medio sensim subloriformi-angustata, apice obtusiuscula subacuta, nervo pellucidiore in carina profunde exarata percurrente, integerrima, cellulis curvatis pellucidis ad tertiam partem folii longitudinis productis, inde parvis rotundatis obscuriusculis; perichætialia breviora, erecta, pellucidiora; vaginula ramentis exsertis; theca in pedunculo brevi, ovalis, operculo longe subulato, ore parvo, ætate obtuse plicato, gymnostoma; calyptra ramentosa.**

Hab. Tutuila, on living trees, mostly *Hibiscus tiliaceus* (20–500 ft.). No. 1.

Closely resembling *M. incurvifolium* (*Orthotrichum*), Hook. et Grev., which is probably identical with *M. subtile*, Schw. t. 192, but with its leaves a little larger, their apices more obtuse, and the curved cells of the lower portion occupying relatively a larger space.

M. ANGULATUM, sp. n. **Rami humiles, graciles, ramosi, laxe cæspitosi; folia patentia, pentasticha, siccaa ppressa contorta, oblongo-linearia, acuta, nervo percurrente carinata, marginibus cellulis prominulis crenulatis, cellulis omnibus grossiusculis rotundatis obscuris, perichætialia propria nulla; vaginula pilosa; theca in pedunculo brevi tetragono asperrimo, ovata, ore parvo (evacuatæ), quater plicato, operculo subulato; calyptra ramentis inferioribus divaricatis pilosa.**

Hab. Tutuila, on Hibiscus trees (1000 ft.). No. 67.

Very nearly resembling *M. orthostichum*, Nees ab E., from Java, but with leaves not wider at their base, and patent, not squarrose or divaricated.

M. GLAUCUM, sp. n. **Rami elongati, ramulosi, late cæspitosi; folia quinquefaria, dense inserta, in spiras ad dextram ascendentes disposita, elongate lanceolata, apice obtusa, nervo in mucronem excurrente, dimidio folii inferiore erectiore, superiore recurvo divaricato carinato, apice subcucullato-carinata integerrima, cellulis inferioribus pellucidis arcuatis ad nervum ultra folii medium productis, superioribus minutis rotundatis obscuris, perichætialia plura conformia æquilonga**

erecta pellucida; theca in pedunculo breviusculo, ovata, ore parvo, operculo subulato; peristomium parvum, dentibus brevibus pallidis; calyptra ramentis appressis eam longitudine haud excedentibus pilosa.

***Hab.* Tutuila, forming extensive mats on Bread-fruit trees nearly at the sea-level. No. 109.**

Habit that of *M. gracile*, but with leaves having a longer pale base, their apices complicate, so as to appear more acute than they are in reality.

M. Powellii, sp. n. Rami elongati, in cæspitibus latis aggregati; folia dense inserta, a basi brevi erecta, recurva, divaricata, sensim ad apicem acutum angustata, nervo rufescente subexcurrente carinata, integerrima, cellulis basi elongatis pellucidis subrectis dimidium folii longitudinis occupantibus sensim in rotundatas obscuriusculas transeuntibus, perichætialia interna breviora lanceolato-subulata pellucida; vaginula pilis paucis brevibus; theca in pedunculo breviusculo, parva, ovalis, ore parvo, operculo subulato, peristomio dentibus brevibus pallidis; calyptra ramentis appressis pilosa.

***Hab.* Tutuila, on Cocoa-nut-trees near the sea-level. No. 110.**

This differs from *M. gracile* (Hook. Musc. Exot. 27) and from *M. recurvifolium*, Hook. et Grev., in its pilose calyptra, and from *M. incurvifolium*, Hook. et Grev., in its gradually narrowed acute leaves; in this last particular it differs also from *M. glaucum* and *M. Beecheyanum.*

Neckera, sectio nova *Tæniocladium.*

Caulis repens, ramis elongatis liberis pendulis æqualiter foliatis pinnatis. Folia distichacea, nervo plus minus elongato, cellulis in partibus folii exterioribus rotundatis. Fructus e partibus remotioribus ramorum ramulorumque oriens. Theca oblonga, æqualis, perichætio immersa. Calyptra brevis, plurifida.

Neckera Lepiniana, *Mont. Ann. des Sc. Nat.* 1848, p. 107; *Bryol. Javan.* t. 191.

***Hab.* Tutuila, on living trees; in fruit near Lanutoo, the mountain lake, Upolu (2570 ft.). No. 2.**

N. gracilenta, *Van den Bosch et Lacoste, Bryol. Javan.* t. 192.

***Hab.* Tutuila. No. 95, without fruit.**

Himantocladium.

Caulis repens, ramis elongatis liberis inferne stipitatis superne pinnatis arbusculosis fasciculatisve. Folia distichacea, nervo plus minus elongato, cellulis in partibus folii ab insertione ulterioribus rotundatis firmis. Fructus e ramis ramulisque

superioribus. Theca oblonga, æqualis, e perichætio parvo exserta. Calyptra brevis, uno latere fissa.

N. IMPLANA, sp. n. Dioica; rami ramulis dispersis subplumæformes, pinnati; folia complanata, lateralia, patentia, ligulata, obtusa, angulo parvo apicali, lævia, plana, nervo crassiusculo infra apicem evanido, marginibus apice minute crenulatis, cellulis apicalibus parvis ovalirotundis, inferioribus sensim longioribus angustis; folia ramea conformia, rarius subundulata; perichætialia parva, a basi convoluta subrotunda subulata patentia, apicibus subserrulatis, enervia; theca ovali-cylindracea, in pedunculo æquilongo, operculo conico curvirostro; peristomium dentibus processibusque angustis obscuriusculis minute punctulatis linea media notatis.

Hab. Tutuila, on living trees near Letaumata (1000 ft.). No. 34.

This very nearly resembles *Neckera loriformis*, Bryol. Javanica, t. 183; but the leaves are wider and flat.

N. LORIFORMIS, *V. d. Bosch et Lac. Bryol. Javan.* t. 183.
Hab. Tutuila, No. 118.

N. MUCRONATA, *V. d. Bosch et Lac. Bryol. Javan.* t. 187.
Hab. Tutuila, on trees (1000 ft.). No. 119.

GAROVAGLIA POWELLII, sp. n. Folia compressa, lateralia, patentia, ovato-oblonga, acuta vel breviter acuminata, quater plicata, plicis dorso infra apicem spinuliferis, marginibus late recurvis a medio usque ad apicem serrulatis, nervis obsoletis, cellulis elongatis, basalibus ad angulos paucis latioribus inconspicuis; perichætialia exserta, erecta, interna convolutacea, latissime obovata, apice subito in acumen subulatum serrulatum producta; theca ovalis, immersa, operculo subulato; peristomium intra orificium callosum rubrum horizontale; dentes rubri, incurvi, teneri, internum processibus pallidis angustissimis æquilongum; calyptra parva, basi lobata, operculo brevior.

Hab. Tutuila, on living trees near Letaumata (1000 ft.). No. 3.

Entirely agreeing with *G. plicata*, Endl., *Endotrichum densum*, Dozy et Molk. Musci Archip. Ind. fasc. i. t. 1, but less robust and evidently compressed, the apices of its leaves scarcely acuminate, and the perichætial leaves wider and more suddenly contracted towards their points.

Sect. *Endotrichum*.

Theca exserta, peristomio infra orificium capsulæ immerso. Calyptra uno latere fissa.

G. SAMOANA, sp. n. Folia subcompressa, lateralia, patentia patulave, late oblongo-ovata, acumine breviusculo semitorto, quater plicata, dorso lævia, nervis crassiusculis ad ¼ folii longitudinis productis, mar-

ginibus superne planis denticulato-serrulatis, basin versus reflexis, cellulis elongate ellipticis, basi paucis incrassatis, aurantiacis; perichætialia parva, interna vaginulam parum excedentia, breviter oblonga, apice subtruncato acumineque brevi subcrenulato, enervia; theca in pedunculo subæquilongo, ovali-cylindracea, basi subinæquali, operculo subulato, peristomio parvo intra orificium sepulto, dentibus parvis, processibus angustis æquilongis.

Hab. **Mātie and Tutuila near Letaumata (1000 ft.). No. 70.**

The beautiful figure in the Bryol. Javan. of *G. Moluccensis*, V. d. Bosch. et Lac. t. 196, gives a good idea of the size and general appearance of the Samoan species—which, however, has narrower leaves, with the lower margins reflexed.

G. ANGUSTIFOLIA, sp. n. Folia compressa, lateralia, patula, elongate lanceolata, sensim acuta, quater plicata, dorso lævia, nervis obsoletis, marginibus plus minus recurvis revolutisve superne serrulatis, cellulis elongatis angustis, ad angulos paucis brevioribus latioribusque; perichætialia quam caulina dimidio breviora, erecta, ovato-lanceolata, apice acuminato dentato; theca in pedunculo thecam cylindraceam inclinatam æquante; operculum curvirostrum.

Hab. **Pacific islands, Nightingale, *in herb. Hooker*.**

This agrees with *G. Samoana* and *G. Moluccensis* in having its capsule exserted; but the leaves are little more than half as wide as in either of those species, and their nerves, as in *G. Samoana*, obsolete.

G. setigera, Sull. Amer. Expl. Exped. t. 18, B (*Endotrichum*), from the Figi Islands, has the teeth of its external peristome trabeculate within, and the internal peristome with narrow processes equalling the external teeth in length, and supported on a membrane which extends to near their middle, in these particulars agreeing with *G. cuspidata* (*Esenbeckia*), Mitten in Hook. Journ. of Bot. vol. viii. p. 263, from Moreton Bay, Australia, and thus differing from *G. plicata* and its allies in the more complete evolution of the peristome, upon which is founded, by M. Schimper, the genus *Euptychium* (*Euptychium*, Muscorum Neocaledonicorum genus novum, Dresden, 1865), *E. neocaledonicum*, Schimp., the only species there mentioned, being, so far as can be seen from the excellent plate, t. 1, identical with *G. cuspidata*.

All the very handsome Mosses referable to *Garovaglia* appear to be destitute of a creeping stem, and in this respect, as well as in the leaves and general appearance, seem to approach very nearly to *Cladomnion* and *Ptychomnion* of Wilson.

AEROBRYUM LANOSUM, *Mitten in Journ. of the Proceed. of the Linn. Soc.* 1859, *Suppl.* p. 90 (Meteorium). (M. longissimum, *Dozy et Molk.*

Musci Archip. Ind. t. 48? *et Bryol. Javan.* t. 202, var. tenue.—M. Vitianum, *Sull. Amer. Expl. Exped.* p. 22, t. 21?)

Hab. Tutuila, on trees in a damp place (1000–1500 ft.). No. 4.

Meteorium Vitianum is probably identical with this species; for, notwithstanding Sullivant's remark that in *Aerobryum longissimum* there are no papillæ, I find them present in authentic specimens of that Moss as well as in the Samoan specimens; and they in each arise from the middle of the cell.

The specific name "*longissimum*" was applied by Raddi to a Brazilian Moss which may prove to be referable to this genus, having the calyptra cucullate and not mitriform as in *Meteorium*.

The rarity of the fruit in these mosses renders the certain identification of species very difficult.

In Mr. Powell's specimens the young calyptra is elongate, as in *A. speciosum*.

METEORIUM INTRICATUM, sp. n. Dioicum; rami graciles, elongati, flexuosi, ramulis divergentibus curvatis laxe pinnatim ramosi; folia ramea undique erecto-patentia, torta, a basi cordata, auriculis crenatis, ovato-lanceolata, sensim acuminata, integerrima, nervo obsoleto, cellulis angustis elongatis brevissime obscureque pluripapillatis; folia ramulina superne latiora, haud acuminata, subserrulata, semitorta, medio inferne canaliculata, nervo tenui infra medium obsoleto; folia perichætialia patentia, longe acuminata; vaginula filis exsertis barbata; pedunculus crassiusculus, sublævis, foliis perichætialibus subduplo longior, curvatus; theca oblongo-cylindracea, inæqualis, operculo subulato; peristomium dentibus elongatis irregularibus nonnullis inter se cohærentibus fissisve obscuris, internum processibus angustis obscuris brevioribus, membrana basilari carens; calyptra inferne pilis paucis barbata. Flos masculus parvus, gemmiformis, antheridia 8–10, paraphysibus paucis immixta fovens.

Hab. Tutuila, on living trees in the shady forests (20–1000 ft.). No. 5. Also in the Figi Islands, *Seemann.*

Branches 2 to 6 inches long, branchlets about half an inch in length, foliage green, dark brown in age. In size, colour, and habit, this species agrees with *M. helictophyllum*, Mont. (*Cryphæa*), from Tahiti; but its longer capsule is exserted, and thus it comes nearer to *M. floribundum*, Dozy et Molk. Musc. Archip. Ind. t. 53; but it differs from this in the cordate-auriculate base of its leaves, and also in the teeth of the external peristome not being united on a base that is exserted above the mouth of the capsule.

M. ÆRUGINOSUM, sp. n. Dioicum; rami elongati, gracillimi, flexuosi,

flaccidi, ramulis curvatisl axe pinnatim ramosi; folia a basi rotundata angulis parvis decurrentibus, ovato-lanceolata, sensim acuminata, planiuscula, compressa, lateraliter patentia, nervo vix cernendo infra medium obsoleto, margine ubique minute serrulata, cellulis angustis minutissime papillosis obscuriusculis; folia ramulina conformia; perichætialia patentia, longius acuminata, pedunculo curvato breviora; theca oblongo-cylindracea, subæqualis, operculo subulato; peristomium dentibus validis intus trabeculatis, internum processibus angustis carinatis in membrana ad dentium longitudinis ¼ exserta impositis.

Hab. Upolu, on trees (1000–2000 ft.). No. 88.

Branches very slender. Foliage, in the young state, pale æruginous green without gloss; when older, of a pale brown.

From *M. floribundum*, Dozy et Molk. Musci Archip. Ind. t. 53, this species differs in its more compressed divergent foliage, and in the teeth of its external peristome being divided to the mouth of the capsule, and not exserted on a combined base.

CRYPTOTHECA VITIANA, *Sull. in Proceed. of the Amer. Acad. of Arts and Sciences*, 1855 (Pilotrichum).

Hab. Tutuila, on Cocoa-nut, Hibiscus, and other trees (1000–2000 ft.). No. 7.

CALYMPERES (HYOPHILINA) PORRECTUM, sp. n. **Caulis humilis elongatusve; folia a basi erecta, suboblonga, patentia, ligulata, latiuscule acuta, nervo concolori obscuro brevissime excurrente acuto, marginibus limbo obscuro vix incrassato apicem versus dentato, inferne intra marginem minute crenulatam ad basin sensim evanido producto, cellulis hyalinis quadratis abbreviatis totam partem folii erectiorem occupantibus, superioribus minutis rotundatis crasse limbatis; folia apicalia (anomala) erecta, longiora, nervo crassiore, lamina folii angustissima, marginato-subulata, apice subcupulata, corpuscula septata foventia.**

Hab. Tutuila, on bark. No. 10.

Stems from 3 lines to 2 inches high, leaves about a line and a half long, pale yellowish green, when dry curved, the terminal anomalous ones remaining erect. This species, although destitute of fruit, is distinct from *C. Dozyanum*, and all the others belonging to the same group, in its dentate leaves.

C. (HYOPHILINA) DOZYANUM, *Mitten*. (C. Moluccense, *Dozy et Molk. Bryol. Javan.* t. 37.)

Hab. Tutuila, on Cocoa-nut-trees, mostly on their western side, which is probably the most humid (10–50 ft.). No. 17.

C. (HYOPHILINA) TAITENSE, *Sull. Amer. Expl. Exp.* p. 6, t. 4 (Syrrhopodon).

Hab. Tutuila, on the sides of stones and rocks over which the rain flows, also on damp trees (20–1000 ft.). No. 25.

A large species, with the habit of those species of *Syrrhopodon* referable to the group *Orthotheca*, Brid.

Calymperes, sectio nova *Himantophyllum*. Folia elongata, angusta, loriformia, indurata, limbata, minutissime areolata.

C. (H.) lorifolium, sp. n. Dioicum (?); caulis humilis; folia a basi oblonga, latiora, cellulis hyalinis quadratis distinctis fere ad apicem usque areolata, ad latera fascia latiuscula e cellulis parvis angustis elongatis firmis, et limbo tenerrimo e cellulis apicibus exstantibus crenulato marginata, subito contracta, longe loriformia, erecto-patentia, sicca laxe curvata subcrispata, apice acuminata, nervo percurrente, limbo obscuro parum incrassato remote serrulato apice paucidenticulato circumducta, cellulis incrassatis pellucidis rotundatis oblatisque; perichætialia conformia, apicibus ad orificium thecæ cylindraceæ attingentibus; pedunculus ruber; operculum conico-subulatum; calyptra plicata, apice acuminata, scabra, basi infra thecam descendens, torta.

***Hab.* Manua, on *Alsophila lunulata*, on the ascent of the mountain Olotane (1400 ft.). No. 47. Figi Islands, *Milne*; also in Borneo, *Motley*.**

Stems half an inch high. Leaves half an inch and more long, rigid.

This differs from *C. serratum* in its narrower stiffer leaves, with the hyaline cells well defined and extending to near the top of the oblong base.

In the Bryol. Javanica, t. 40, there are figured (No. 5 and No. 6) two stems which probably belong to *C. lorifolium*.

C. (H.) serratum, *Braun, Bryol. Javan.* t. 40.

***Hab.* Tutuila, No. 139.**

In this species the stems appear to be always very short in proportion to the length of the leaves and seta.

Belonging to this section, and known only in a barren state, is

C. (H.) longifolium, sp. n. Caulis brevissimus; folia a basi elliptico-oblonga, superne marginibus denticulis ciliata et cellulis hyalinis usque ad apicem continuatis areolata, inde angustata, patentia, longissime anguste loriformia (biuncialia), apice acuminata, margine remote breviter serrulata, limbata, nervo excurrente, cellulis superioribus minutis rotundatis firmis.

***Hab.* in insula archipelagi Indici Labuan, *Motley*.**

This remarkable species has leaves exceeding in length those of any other known moss; they are, however, very narrow and thin, but firm and scarcely altered by drying.

PYRRHOBRYUM, gen. nov.

Caulis erectus, simplex, rarius divisus. Folia undique inserta, inferiora minora sensim versus caulium altitudinem mediam majora, exinde ad apicem decrescentia, rigida, nervo rigido valido percurrente excurrenteve marginibusque argute serratis, cellulis parvis rotundis limitibus latis rigidis obscuris. Fructus in ramulo brevissimo basilari. Theca cylindracea, plicata, horizontalis, operculo rostrato, peristomio *Stereodontis*. Calyptra cucullata.

P. SETOSUM, sp. n. Dioicum; folia in ramis sterilibus patentia, apicalia, erecta, appressa, recta subsecundave, a basi sensim subulata, angusta, elongata, setacea, rigida, nervo crasso percurrente, superne dorso dentato, margine incrassata, basi integerrima, superne breviter duplicato-dentata, a medio usque ad apicem dentibus validioribus simplicibus serrata, cellulis parvis rotundis limitibus latis; perichætium in ramo brevi, foliis a basi parva ovata longe anguste subulata curvata, nervo excurrente marginibusque superne dentatis. Habitus *P. spiniformis*.

Hab. Upolu, on trees on the way to Lanutoo (2000 ft.). No. 11.

Size, mode of growth, and colour of the foliage as in *P. spiniforme*, Linn. (*Hypnum*), but with leaves scarcely half as wide, more bristle-like and rigid; the teeth towards the apex of the leaf are evidently a continuation of the margin; so that the nerve is not terete and excurrent, as is stated to be the case in *P. pungens*, Sull. Amer. Expl. Exp. (*Rhizogonium*), which appears also to be a much larger species in all its parts.

P. SPINIFORME, *Linn.* (*Hypnum*), forma Samoana. Folia angustissime lineari-lanceolata, nervo percurrente, dorso dentata, margine duplicato serrata; perichætialia ovato-subulata, simpliciter serrulata; theca oblonga, operculo brevirostro, peristomio interno processibus quam dentes brevioribus in membrana fere ad eorum medium exserta impositis, ciliis obsoletis.

Hab. Upolu, on trees (1000–2000 ft.). No. 90.

A little more slender than the usual states of this common Tropical-American species, and possibly distinct; but the cilia are not uniform in length or number in American specimens.

Besides the *P. latifolium* of Java, there is another species in that region.

P. LONGIFLORUM, sp. n. Dioicum? folia in caule sterili patula, incurva, anguste lineari-elliptico-lanceolata, basi angustata, nervo crasso superne dorso dentato percurrente, marginibus incrassatis et dentibus brevibus duplicatis serratis, cellulis parvis rotundis firmis; folia flo-

ralia a basi parva oblonga parum latiore, longe loriformi-subulata, duplicato-serrata, nervo percurrente; theca elongato-oblonga, arcuata, plicata, operculo subulato, peristomio normali completo.

Hab. in insula archipelagi Indici Labuan, in arboribus emortuis putrescentibusque sylvarum densissimarum, *Motley*.

Habit, size, and general appearance that of *P. spiniforme*, Linn. (*Hypnum*), but distinct in its leaves being narrowed at the base, its different inflorescence, and elongated perichætial leaves; it is as maller species than *P. latifolium*, V. d. B. et Lac. Bryol. Javanica, t. 133 (*Rhizogonium*), and has narrower leaves.

PHOTINOPHYLLUM, gen. nov.

Caulis erectus, simplex, basi tantum inter radices ramulos brevissimos florentes fovens. Folia undique inserta, nervo angusto, cellulis majusculis pellucidis splendentibus areolata. Theca longe pedunculata, lævis, horizontalis, operculo brevi, peristomio *Stereodontis*. Calyptra angusta, cucullata.

P. SUBBASILARE, *Hook. Musc. Exot.* t. 10 (Hypnum).

Hab. Tutuila. No. 136.

A few fragments only of this species were found, amongst other Mosses; and they appear to be specifically indentical with the Fuegian Moss.

Other species belonging to this genus are *P. reticulatum*, Hook. f. et Wils. Crypt. Ant. t. 154. f. 5 (which appears to have its foliage compressed, although not bifariously inserted, as might be supposed from the figure), and

P. PELLUCIDUM, sp. n. Monoicum; folia laxe patentia, ligulato-elliptica, nervo sub apice evanescente, limbo angustissimo, superne denticulis duplicatis serrato-marginata, cellulis oblongo-ellipticis pellucidis anguste limitatis areolata; perichætialia lanceolato-subulata, parce serrulata; theca in pedunculo elongato, cylindracea, collo crasso subito flexo, horizontalis, operculo conico, peristomio interno processibus subulatis carinatis, ciliis tribus capillaribus interpositis, in membrana parietibus cellularum prominulis, ad dentium peristomii exterioris medium usque exserta impositis.

Hab. in Tasmania, *Archer*; Australia, *Dr. F. Mueller*; New Zealand, *Dr. Knight*.

Like *P. subbasilare* in size and habit, but with more pellucid leaves, which are also serrate, with duplicate teeth.

SYRRHOPODON (ORTHOTHECA) CROCEUS, *Mitten, Journ. of the Proceed. Linn. Soc.* 1859.

Hab. Tutuila, and in all the islands, on trees (2000–2500 ft.). No. 12.

In some of the Samoan specimens of this moss the stems are 6 inches high; it seems to grow in large tufts.

S. (Orthotheca) glauco-virens, sp. n. Dense cæspitosus; caulis elongatus; folia a basi oblonga erecta, superne marginibus denticulis armata, inde lineari-spathulata, obtusiuscula, patentia, nervo percurrente dorso sub apice papilloso spiculoso, marginibus basi latiusculis teneris superne limbo teretiusculo crassiore involutis papillosis denticulis remotis inconspicuis apice subcrenulatis, cellulis hyalinis basis $\frac{2}{3}$ occupantibus, superioribus minutis rotundatis obscuris papillosis.

Hab. Tutuila and Upolu, on trees. No. 99.

A little less than *S. croceus*, its leaves of a pale brownish green, the younger somewhat glaucous, and not coloured at the base, where the margins are denticulate.

S. albovaginatus, *Schw.* t. 131.

Hab. Tutuila, Le Taumata, on decayed wood (1000 ft.). No. 23.

S. tristichus, *Nees, Schw.* t. 311; *Bryol. Javan.* t. 44.

Hab. Upolu, on trees near the crater of Tafua-ā-Upolu (1000 ft.). No. 74.

S. (Calymperidium) aristifolium, sp. n. Caulis brevis; folia e basi erecta ovata, subulata, patentia, longissime angustissime angustata, nervo crassiusculo in aristam plus minus elongatam excurrente apice subdenticulato, margine superne remote breviter subdentato hic illic parum recurvo, limbo nullo, cellulis hyalinis dimidiam inferiorem occupantibus ovatis et per totam folii latitudinem dispositis, superioribus minutis quadrato-rotundatis lævibus pellucidis; perichætialia conformia; theca in pedunculo quam folia breviore, parva, cylindracea; calyptra (juvenilis) inferne plicata, apice scabra.

Hab. Upolu, on trees (1000–2000 ft.). No. 89.

Habit and foliage like that of the next species, entirely agreeing with the species of *Calymperes* belonging to the section *Himantophyllum*; so that, in the absence of fruit with calyptras, the species can only be referred to either with doubt.

S. (Calymperidium) Mulleri, *Bryol. Javan.* t. 42.

Hab. Upolu, on trees. No. 120.

Pelekium, gen. nov.

Caulis procumbens, bipinnatim ramosus, phyllidiis vestitus. Folia uninervia, cellulis rotundatis papillosis areolata. Fructus lateralis, theca longe pedunculata. Peristomium *Leskeæ*. Calyptra magna, plicata, basi multifida.

P. velatum. Monoicum; caulis depressus, procumbens, subarcuatus,

repens, radicans, elongatus, phyllidiis obtectus, ramis phyllidiis paucis sparsis plumæformibus pinnatis bipinnatus; folia in caule primario laxe disposita, patentia, a basi parva, cordato-triangularia, biplicata, caviuscula, longe subulata, attenuata, apice cellulis in serie singula confervoidea articulata pellucida terminata, nervo crassiusculo concolori dorso scabro supra medium evanido, marginibus inferne recurvis usque ad basin apiculi confervoidei crenulatis, cellulis rotundatis papillosis haud obscuris; folia ramea compressa, lateraliter patentia, ovata, acuta, nervo dorso crenato supra medium evanido carinata, margine late recurvo crenulata; ramulina compressa, ovata, obtusiuscula, nervo dorso crenato prominulo sub apice evanescente carinata, marginibus crenulatis, cellulis papillosis obscuriusculis; folia perichætialia patentia, albida, a basi lata truncata, sensim longe lanceolato-subulata, nervo crassiusculo superne subdenticulato longe excurrente, marginibus inferioribus serrulatis, cellulis elongatis angustis lævibus; vaginula filis paucis vestita; pedunculus elongatus, rufus, ubique setulis pallidioribus obtectus; theca horizontalis, demum pendula, ovalis, brevis; operculum subulatum, longe rostratum; peristomium dentibus rubris firmis subulato-attenuatis, internum processibus solidis carinatis subæquilongis, ciliis brevibus in uno coalitis carentibusve, in membrana fere ad dentium medium exserta impositis. Calyptra magna, albida, companulata, acuminata, thecam totam obtegens, inferne plicata pluries lobata, setulis ubique inspersa.

Hab. Tutuila, on damp stones and decayed logs in woods and other shady places (10–50 ft.). No. 14. Also found in Borneo and Java, *Motley*.

In habit, colour, and appearance, this small moss corresponds with the smaller species of that group of *Hypna* which have been named *Thuidium* by Schimper, but differs in having the calyptra as in *Hookeria*.

Under the name of *Thuidium trachypodium* (Mitten), Van den Bosch et Lac., there are figured in 'Bryologia Javanica,' t. 225, portions of *P. velatum*, or of some closely allied species, which has been mistaken for, or confused with, the *Thuidium*; the portions which probably belong to *Pelekium* are figured at Nos. 38, 39, 40, 41 & 43. *Thuidium trachypodium* has its calyptra small, split on one side, and smooth, its capsule more cylindraceous, and its setæ papillose and not setulose.

DICRANELLA FLACCIDULA, *Mitten in Bonplandia*, 1861, p. 365 (Leptotrichum).

Hab. Tutuila, on muddy banks (10–20 ft.). No. 15.

BRYUM (DICRANOBRYUM) COARCTATUM, *C. Müller. Syn.* i. p. 312.

Hab. Tutuila, mostly on stone walls, especially where there is lime (1–10 ft.). No. 16.

Octoblepharum dentatum, sp. n. Caulis elongatus, cæspitosus; folia a basi erecta, elongate oblonga, cellulis breviter oblongis hyalinis areolata, limbo tenui angusto marginata, sensim subulata, elongata, patenti-recurva, apice obtusiuscula, minute multidentata, nervo basi angusto superne incrassato et supra basin oblongam totam folii occupante trigono spongioso lævi; perichætialia interna minora, acutiora; theca in pedunculo brevi, elliptico-cylindracea, collo sensim attenuato.

Hab. Upolu, near the crater called Tafuā-ā-Upolu (1000 ft.). No. 19.

Stems from 1 to 2 inches high, brownish red, but everywhere covered by the appressed clasping bases of the leaves, which are about 4 lines long, white or with a slight tinge of green; they retain the same position and appearance either wet or dry.

Much taller, and with more recurved leaves than *O. Schimperi*, Dozy et Molk., Musc. Archip. Ind. t. 27 (*Arthrocormus*), which differs scarcely in any particular from *Octoblepharum* beyond the tristichous leaves.

O. asperum, sp. n. Dense cæspitosum, glauco-albo-virens; folia a basi erecta, oblonga, cellulis oblongis hyalinis areolata, subulato-angustata, acuta, erecto-patentia, nervo, in basi oblonga tertiam partem folii latitudinis, superne fere totam occupante, intus extusque superne papillis dense obtecto, utraque lamina folii angusta, e cellularum quadratarum serie singula usque ad apicem continuata, ubique limbo cartilagineo angusto supra partem oblongam minute versus apicem argutius serrulatum marginata.

Hab. Upolu, on trees (1000 ft.). No. 113.

Stems half an inch or an inch high, very much like *O. dentatum*, but a little more slender.

O. scabrum, sp. n. Humilis; folia a basi anguste oblonga, erecta, cellulis oblongis areolata, limbo angusto superne denticulis aculeiformibus ciliato marginata, nervo crasso excurrente elongato patente subtereti-trigono ubique scaberrimo apice obtusiusculo minute denticulato.

Hab. Tutuila. No. 126.

This curious species agrees very nearly with *O. Blumei*; but it is considerably larger, and the thick nearly terete nerve is covered with shorter papillæ.

Besides the above, two other intimately allied species have been sent from Java.

O. hispidulum, sp. n. Humilis; folia a basi erecta, oblonga, cellulis oblongis quadratisque pellucidis areolata, angustata, linearia, obusiuscula, patentia, nervo crasso intus extusque setulis hispidulo, lamina folii e cellularum quadratarum hyalinarum in seriebus binis ad apicem usque continua, limbo angusto supra basin denticulis aculeiformibus elongatis inferioribus longioribus ciliato marginata.

Hab. in Java, in regione superiore montis Pangerango (7000–10000 ft.), *Motley*.

In size similar to *O. Blumei*, Nees (*Syrrhopodon*), but differing in the leaves having to their apices a distinct narrow pellucid lamina.

O. PAPILLOSUM, sp. n. Humilis; folia a basi erecta, oblonga, cellulis rhombeis quadratisque areolata, angustata, linearia, obtusciuscula, patentia, nervo crasso in parte patente papillis elongatis setulæformibus obtecto, lamina folii usque ad apicem continuata e seriebus singulis binisve cellularum quadratarum hyalinarum composita, limbo incrassato dense papilloso-serrulato marginata.

Hab. in Java, *ex herb. Nees v. Esenbeck*.

This differs from *O. Blumei* in the same respect as *O. hispidulum*.

In *O. Blumei*, which has been placed by C. Müller, Syn. ii. p. 537, in *Leucophanes*, the leaves above the base are entirely occupied by the plano-convex nerve, and thus differ from those of *Leucophanes candidum*, Hornsch. (*Syrrhopodon*), which have the nerve flattened; and it is scarcely observable, except on cross section, that the leaf is really composed of dilated nerve two cells thick, with a narrow obscure thread running through the middle.

O. RECURVUM, sp. n. Caulis elongatus, densifolius; folia a basi erecta, ovali, convoluta, sensim angustata, patentia recurvaque, subcomplicata, apice denticulata, nervo excurrente dorso subserrulato, limbo angustissimo in parte folii erectiore latiore marginata; perichætialia erecta, angustiora; theca in pedunculo gracili rubro, ovali-cylindracea, fusca, vernicosa.

Hab. Upolu, on trees. No. 104.

Similar to *O. densifolium*, Mitten (*Leucophanes*), from the Figi Islands, but with leaves more narrowed above, the lower leaves more recurved, very white, those towards the apices of the stems slightly tinged with very pale green or brown.

Notwithstanding the remarks in C. Müller, Syn. i. p. 86, where, and in p. 85, *Arthrocormus Schimperi* is stated to have nerveless leaves, and the opposite opinion held by Bridel and Dozy et Molkenboer is considered erroneous, an examination of the species referred to the genera *Octoblepharum* and *Leucophanes* can only lead to the conclusion that the whole of the upper portion of the leaf of *O. albidum* is a dilated nerve, thickened with five or six layers of cells, that of *Leucophanes octoblepharoides* differing only in being but two layers of cells in thickness.

Ectropothecium, gen. nov.

Caulis procumbens prostratusve, pinnatus. Folia compressa, diversiformia, sæpe secunda falcatave, brevissime binervata enerviave, cellulis angustis alaribus inconspicuis. Theca longe pedunculata, flexura brevissima, pendula, brevis, subæqualis, ore magno, operculo brevirostro, peristomio *Stereodontis*.

E. Tutuilum, *Sull. Amer. Expl. Exp.* t. 10. f. A (Hypnum).
Hab. Tutuila, on decayed logs (500–1000 ft.). No. 20.

In this, as in many other allied congeneric species, the upper ends of the cells are protuberant on the back of the leaves.

E. sodale, *Sull. Amer. Expl. Exp.* t. 12. f. B (Hypnum).
Hab. Tutuila, on decayed logs (10–1000 ft.). No. 46.

E. Pacificum, sp. n. Monoicum; caulis procumbens, elongatus, ramis brevibus approximatis pinnatus; folia subcompressa, media ovato-elongate-lanceolata, in acumen sensim angustata, breviter binervata, margine ubique serrulata, cellulis angustis supra folii medium finitis dorso exstantibus papillata, alaribus paucissimis pallidis; folia intermedia, lateralia, inferioraque falcata uncinataque; perichætialia erecta, interna elongata, apicibus subulatis serrulatis; theca in pedunculo elongato, breviter oblonga, flexura pedunculi angustissima, pendula.
Hab. Samoa, without fruit, *Powell*; Jobic Island, also in Erromanga, *Bennett, herb. Hooker.*

In size and appearance similar to *E. Buitenzorgii*, Bel. (*Hypnum*); but in that the leaves are smooth.

Under the genus *Ectropothecium* it is proposed to arrange a number of species hitherto referred to *Hypnum*. All the species are conspicuous for their regularity and closely pinnate prostrate stems, which do not appear to become congested into tufts, but to be always appressed to the surface on which they grow. The foliage, as is usual in the extensive family of Mosses, of which this genus is but a small portion, is composed of leaves inserted in ten different positions on the stem, each leaf having a distinct form, and none of symmetrical outline but those which are inserted on the middle of the upperside of the stem. The capsule is in all the species small, short, and without an attenuated neck, perfectly pendulous when old, and supported upon a long seta, curved only at its apex.

E. fuscescens, *Hook. et Arnott in Beechey, Voy.* t. 19 (*Hypnum*). (H. apertum, *Sull. Amer. Expd.* t. 16. f. A.)

Hab. Tutuila, on stones and rocks in gullies and streams where the flow of water is frequent (1–100 ft.). No. 45.

In Beechey's specimen from Tahiti the inflorescence is monœcious; and there seems to be no difference between it and those from Tutuila, excepting that the latter are greener, and, when old, change to pale brown.

This is the largest described species belonging to the group named in Dr. C. Müller's Synopsis, ii. p. 238, *Vesicularia*, there made a section of his *Omalia*; but they do not present any considerable difference from *Ectropothecium* beyond the very lax areolation, which at first sight might lead to their being supposed to be *Hookeriæ*, to which some species have been referred.

LEUCOMIUM, gen. nov.

Caulis procumbens, parce vageque ramosus. Folia compressa, diversiformia, enervia, laxissime elongate areolata, cellulis alaribus carentibus. Theca parva, horizontalis, operculo longirostro, calyptra angusta latere fissa, peristomio *Stereodontis*.

L. DEBILE, *Sull. Amer. Expl. Exp.* t. 21 (Hookeria).

Hab. Tutuila, on decayed trees (500–1000 ft.). No. 24.

The soft, pale, almost white foliage of the species belonging to this small genus gives the plants much the appearance of being diminutive allies to *Hookeria lucens*, Sm.; but the calyptra is not different from that found in mosses usually referred to *Hypnum*. *L. debile*, like all its congeners, has a very lax areolation; and this, with the sparingly branched stems, which seem to be without any creeping base, and adhere by a few rootlets either to decaying wood or leaves, renders it difficult to place them in any known group of Hypnoid Mosses, or to avoid the conclusion that they form a natural genus of themselves.

TRICHOSTELEUM, gen. nov.

Caulis repens, ramis assurgentibus in cæspites laxos depressos congestis pinnatus. Folia uniformia, enervia, cellulis plus minus angustis ut plurimum papilliferis, alaribus conspicuis coloratis. Fructus e ramis oriens. Theca in pedunculo elongato gracillimo, minuta, ovalis, siccitate sub ore magno contracta, demum pendula, ore hiante, operculo tenuiter rostrato, peristomio *Stereodontis*.

T. STIGMOSUM, sp. n. Monoicum, depresse cæspitosum; folia patentia, elliptica, acuminata, acumine semitorto, concava, margine ser-

rulata, cellulis elongatis papillis grossis, alaribus conspicuis; perichætialia erecta, longiora, angustiora, apice latiuscula, argute denticulata; theca in pedunculo elongato, ovalis, pendula; peristomium internum ciliis singulis brevibus; calyptra versus apicem scabra.

Hab. Upolu, Matafao (1000 ft.). No. 21.

Pale straw-coloured without gloss. Seta smooth. Nearly resembling *T. papillatum* (*Hypnum*), Hornsch., but more slender.

T. FISSUM, sp. n. **Dioicum; caulis ruber, brevis, fasciculatim ramosus, in cæspitem latum depressum congestus; folia patentia, anguste elliptico-lanceolata, concava, acuminata, versus apicem flexuosa, margine recurva, superne serrulata, cellulis elongatis supra folii medium, papillis singulis e media cellularum singularum superficie oriundis punctata, cellulis alaribus conspicuis pallidis; folia perichætialia brevia, subovata, superne bi- trifida, laciniis serrulatis; theca in pedunculo flexuoso dimidio superiore scabro, ovalis, æqualis, suberecta, operculo longe subulato, peristomio dentibus crassiusculis intus trabeculatis, interno processibus æquilongis carinatis, ciliis nullis, in membrana ad dentium longitudinis ⅓ exserta; calyptra apice subscabra.**

Hab. **Upolu, on trees. No. 116.**

A little less than *T. stigmosum*, and more yellow; in the form of its leaves closely resembling it, but sufficiently different in the scabrous setæ and lacerate perichætial leaves.

ACANTHODIUM, gen. nov.

Caulis repens, assurgens, arcuatus, ramos fasciculatim ramulosos in cæspites latos congestos fovens. Folia æqualia, ut plurimum lata, longe cuspidata, cellulis angustis alaribus conspicuis. Fructus e ramis oriens. Theca longe pedunculata, oblonga, inæqualis, horizontalis, operculo brevirostro; peristomium *Stereodontis*.

A. RIGIDUM, *Nees et Reinw.* (Hypnum), *Bryol. Javan.* t. 238.—**Hypnum trismegistum, *Mont.*—H. Calderense, *Sull. Amer. Expl. Exp.* t. 15?**

Hab. **Tutuila, on trees and rocks in gullies on the sides of the mountains (1200–1500 ft.). No. 55.**

A. PAPILLATUM, ***Harvey in Lond. Journ. of Bot.* 1840; *Hook. Icon. Plant. Rar.* i. t. 23. f. 8 (Hypnum).**

Hab. **Tutuila. No. 125.**

ACROPORIUM, gen. nov.

Caulis primarius repens, ramos elongatos ramosos in cæspites congestos prodens. Folia nitida, undique inserta, uniformia, in ramorum apicibus cuspidatim imbricata, cellulis elongatis alaribus magnis conspicuis. Fructus e partibus superioribus ramorum

oriens. Theca in pedunculo gracillimo, minuta, ovalis, inclinata, operculo longirostro, peristomio *Stereodontis*.

A. LAMPROPHYLLUM, sp. n. Dioicum? late cæspitosum, ramulosum; folia patentia, subcompressa, in ramulorum apicibus in cuspidem angustam appressa, anguste lanceolata, sensim acuminata, margine versus apicem involuta, integerrima, dorso infra apicem apicibus parvis cellularum elongatarum exstantibus subpapillosa, inferne lævia cellulis alaribus conspicuis pallidis; perichætialia a basi erecta ovata, subulato-attenuata, serrulata, patula; theca in pedunculo elongato subscabro, ovalis, inclinata; peristomium externum dentibus crassis trabeculatis, internum ciliis singulis inter processus impositis.

Hab. Upolu, on trees (1000 ft.). No. 114.

The figure, in Hampe, 'Icones Muscorum,' of *Hypnum subulatum* very well represents this moss; but its leaves are entire and subpapillose on the back.

A. MACRORHYNCHUM, sp. n. Dioicum, elatum, subpinnatum, dense cæspitosum; folia patentia, in ramorum apicibus in cuspidem angustam imbricata, elliptico-lanceolata, sensim acuta, marginibus superne involutis integerrimis, enervia, cellulis elongatis lævibus, alaribus conspicuis; perichætialia e basi erecta late ovali, convoluta, breviter subulata, apicibus serrulatis; theca in pedunculo tenui elongato apice subscabro, ovalis, inclinata, operculo rostro tenui quam theca duplo longiore, peristomio interno processibus dentium longitudinis, ciliis singulis brevioribus.

Hab. Manua, on large trees in moist places (2000 ft.). No. 115.

Stems 4 inches. Habit that of *A. hyalinum*, Reinw. (*Hypnum*); Schw. t. 227, but with acute leaves, which are longer and more spreading than those of *A. turgidum*, Dozy et Molk. (Hypnum).

A. BREVICUSPIDATUM, sp. n. Monoicum; caulis inæqualiter pinnatim ramosus, elongatus; folia patentia, laxe imbricata, in ramorum apicibus in cuspidem brevem congesta, late oblongo-ovalia, breviter acuminata, concava, margine versus apicem incurva, integerrima, cellulis angustis lævibus pellucidis, alaribus conspicuis aurantiacis; perichætialia parva, caulinis conformia, integerrima; theca in pedunculo elongato gracillimo apice scabro, oblonga, parva, inclinata, peristomio interno ciliis singulis processibus brevioribus?

Hab. Manua, on large trees (1500 ft.). No. 137. Also from the Sandwich Islands and South-Sea Islands, *herb. Hooker*.

Corresponding in size, habit, and appearance with *A. turgidum*, Dozy et Molk. (*Hypnum*); inflorescence, however, monœcious, and foliage paler and softer.

A. TURGIDUM, *Dozy et Molk.*, *C. Müller*, *Syn.* ii. p. 390 (Hypnum).

Hab. Upolu, trees near the crater called Tafuā-ā-Upolu (1000 ft.). No. 138.

Appears to be identical with the Javan species; but our specimens are incomplete.

Hypnum (Sigmatella) Samoanum, sp. n. Monoicum, late depresse cæspitosum; folia compressa, lateralia, patentia, ovato-lanceolata, acuminata, rameaovata concava acuta basi constricta, marginibus serrulatis, cellulis elongatis papillis conspicuis quatuor notatis, basalibus ad angulos paucis minoribus abbreviatis; perichætialia erecta, interna subulata, apicibus angustis serrulatis; theca in pedunculo gracillimo rubro, ovalis, pyriformis, horizontalis.

Hab. Upolu, on trees (2000 ft.). No. 132.

More slender than the Indian *Hypnum Nepalense*, Schw., but with the same habit and structure.

H. (S.) tenuisetum, *Sull. Amer. Expl. Exp.*

Hab. Tutuila. No. 133.

H. (S.) Borbonicum, *Bel. Voy. Crypt.* t. 11. f. 2 (Leskea).—H. Pickeringii, *Sull. Amer. Expl. Exp.* t. 15. f. A.

Hab. Tutuila. No. 117.

Fissidens lagenarius, sp. n. Monoicus, pusillus; folia circiter 10-juga, patentia, oblongo-linearia, acuta, nervo pellucido percurrente, lamina vera usque ad medium producta, apice subæquali, una cum lamina dorsali apicalique limbo carente minutissime crenata, cellulis minutis rotundis inter se remotiusculis vix obscuris minute papillosis; pedunculus foliis superioribus æquilongus; theca inclinata, cylindracea, pallida, laxe areolata, post operculi conico-subulati delapsum infra os constricta sublageniformi; peristomium dentibus teneris luteis brevibus irregularibus.

Hab. Tutuila, on *Cyathea leucolepis*, Mett. (1000–2000 ft.). No. 22.

Entire plant, including the fruit, about 3 lines high. This species differs from the following in its less obscure leaves and in the elongate capsule.

F. scabrisetus, sp. n. Monoicus; caulis elongatus; folia patentia, approximata, elliptico-lanceolata, nervo angusto pellucido percurrente, lamina vera ad medium usque producta subæquali, a basi usque ad medium hyalino-limbata, lamina dorsali basi rotundata, marginibus ubique tenuissime crenulatis, cellulis minutis obscuris viridibus minutissime papillosis; theca in pedunculo brevi aspero, ovalis, inclinata, operculo subulato obliquo; flos masculus in axillis foliorum superiorum.

Hab. Tutuila. No. 63.

Stems about 4 lines high, with about twelve pairs of leaves, the entire width of the fronds being about 1 line. The seta a line or a line and a half long. The capsule with vesicular cells and a red mouth.

P. INCONSPICUUS, sp. n. Monoicus, pusillus; folia circiter sexjuga, patentia, lineari-lanceolata, acuminata, nervo pellucido percurrente, lamina vera usque ad medium producta subæquali, omnibus laminarum marginibus crenulatis, limbo carente, cellulis minutis rotundis pallidis obscuris papillosis; theca in pedunculo breviusculo, parva, obovata, inclinata, operculo subulato.

Hab. Tutuila and Upolu, on *Cyathea leucolepis* (1000–2000 ft.), No. 121.

Stems and leaves about a line high, pale green or rusty brown. Seta half as long again as the leaves.

MEIOTHECIUM, gen. nov.

Caulis procumbens, repens, ramos assurgentes emittens. Folia undique inserta, enervia, cellulis elongatis lævibus, alaribus plus minus conspicuis areolata. Fructus lateralis, parvus; theca parva, breviter pedunculata. Peristomium simplex, externum, vel cum interno plus minus evoluto. Calyptra parva, latere fissa.

M. STRATOSUM, sp. n. Dioicum; caulis procumbens, subpinnatus; folia laxe inserta, compressa, lateralia, patentia, elliptico-lanceolata, subacuminata, superiora ovali-oblonga acuta, inferiora lanceolata, omnia integerrima concava, marginibus subplanis, cellulis elongatis, alaribus 3–5; perichætialia erecta, lanceolata, denticulata; theca in pedunculo brevi, ovalis, inclinata; calyptra apice scabra.

Hab. Tutuila. No. 27.

In size less than *M. microcarpum*, and differing from it in inflorescence and perichætial leaves.

M. MICROCARPUM, *Harvey in Hook. Icon. Pl. Rar.* t. 24. f. 12 (Pterogonium).

Hab. Tutuila, on the bark of orange-trees (600 ft.). No. 36.

M. INTEXTUM, sp. n. Dioicum; caulis subpinnatim ramosus, in cæspitem latum depressum intextus; folia sursum secunda, patentia, ovato-oblonga, acuta, concava, marginibus late recurvis integerrimis, cellulis oblongis ovalibusque, alaribus pluribus, parvis per folii basis latitudinem dispositis; perichætialia lanceolata, obtusiuscula, serrulata; theca in pedunculo brevi rubro, ovalis, inclinata, operculo conico brevirostro; peristomium simplex; calyptra scaberrima.

Hab. Manua, on bread-fruit trees (500 ft.). No. 42.

Obscure fulvous green, rather rigid, closely interwoven into extensive patches. It is very much less than *M. microcarpum*, and differs from it in the diœcious inflorescence and incomplete peristome.

PHILONOTIS ASPERIFOLIA, sp. n. Dioica; caules humiles, graciles, in cæspites latos aggregati; folia patentia, ovato-lanceolata, ramea magis

oblongo-lanceolata, omnia nervis dorso superne serratis percurrentibus, marginibus anguste recurvis serrulatis, cellulis pellucidis, superioribus oblongis, inferioribus subquadratis; perichætialia longiora, a basi latiora, subulata, serrulata; theca in pedunculo elongato, subglobosa, inæqualis, horizontalis, plicata, operculo depresse conico; peristomium depressum, internum externumque dentibus fere lævibus; flos masculus parvus, foliis a basi rotundata subulatis erectis.

Hab. Tutuila, on damp earth and on rocks by water-courses (20–100 ft.). No. 28.

Stems from a quarter to half an inch high. Leaves pale green, small and short, very rough from the serratures of the margins and nerve. Seta half an inch long.

Near to the South-American *P. tenella*, C. Müller.

THUIDIUM EROSULUM, sp. n. **Monoicum; caulis repens, intricatus, bipinnatim ramosus; folia patentia, triangularia, subulato-acuminata, nervo sub apice evanido, marginibus reflexis subintegerrimis, cellulis obscuris, papillis brevissimis; folia ramea ovata acuta ramulinaque ovata obtusiuscula compressa, nervo pallido dorso scabro carinata, marginibus crenulatis, cellulis papillosis obscuris areolata; perichætialia ovata, superne denticulata, exinde longe subulata, anguste attenuata, subintegerrima, nervis percurrentibus; pedunculus elongatus, scaber; theca oblonga, subhorizontalis, operculo subulato; peristomium internum ciliis in unum coalitis.**

Hab. Tutuila, on stones, rocks, and roots of trees in shady places (10–50 ft.). No. 29. Wakoya, Figi Islands, *Milne*.

This small species resembles very closely in its size and habit, as well as in the colour of its foliage, *Pelekium velatum*; but its fruit and calyptra are as usual in the smaller forms of *Thuidium*.

T. SAMOANUM, sp. n. **Caules procumbentes, erecti arcuatique, pennæformiter bipinnati; folia caulina appressa, a basi subtriangulari-ovata sensim in acumen ligulatum obtusiusculum producta, lævia, nervo infra apicem evanido, margine crenulato, cellulis rotundis, papillis fere obsoletis; perichætialia interna, a basi lata sensim angustata et in acumen elongatum loriforme flexosum obtusum crenulatum producta, marginibus inferne ciliis pluribus elongatis angustis ciliata; theca in pedunculo elongato, cylindracea, arcuata, horizontalis.**

Hab. Tutuila and Manua, on large stones in gullies (100–2000 ft.). No. 105. Guadalcanar, Solomon Islands, *Milne*. Figi Islands, *Seemann*.

Very distinct from the many allied species in the ligulate apices of its cauline leaves and in the smoothness of those of the ramuli.

T. RAMENTOSUM, *Mitten in Bonplandia*, 1861 (Leskea).

Hab. Manua, in beds of gullies (1400–1500 ft.). No. 124.

Porotrichum elegantissimum, sp. n. Dioicum; stipes brevis, foliis paucis patulis ovatis, superne in frondem eleganter plumæformi-bipinnatim ramosam expansus; folia in rami primarii medio compressa, lateraliter patentia, ovata, apice latiuscule acuta, nervo infra apicem desinente, marginibus apice serrulatis, cellulis superioribus rotundis, mediis oblongis, basalibus elongatis; folia ramulina minora, conformia; perichætialia a basi lata, suborbiculata, subulata.

Hab. Tutuila, on living trees near Letaumata and elsewhere (1000 ft.). No. 33.

In habit and size resembling *Neckera anacamptolepis*, C. Müller, Bryol. Javan. t. 186, but with leaves not undulated.

Phyllogonium angustifolium, *Schimp.*

Hab. Samoa, on living trees in all the islands, principally in the low woods. No. 35.

Agrees exactly with a specimen from the Marquesas Islands given by Dr. Schimper.

Rhacopilum convolutum, *C. Müller, Syn.* ii. p. 13.

Hab. Upolu, near Tafuā-ā-Upolu (1000 ft.). No. 39.

All the specimens without fruit, but probably referable to this species.

R. spectabile, *Reinw. et Hornsch. Bryol. Javan.* t. 144 et 145.

Hab. Tutuila, on trees (2000 ft.). No. 65.

Powellia, gen. nov.

Caulis repens. Folia diversiformia, superiora minora, inferiora majora. Fructus lateralis. Theca æqualis, pedunculata. Calyptra latere fissa (lævis ?).

P. involutifolia, sp. n. Caulis prostratus, repens, ramosus, latere inferiore densissime radiculosus; folia heteromorpha, subsexfaria, seriebus duabus superioribus minoribus ovato-ligulata, obtusa subacutave, sursum patentia recurvave, seriebus inferioribus utroque latere binis lateraliter patenti-divergentia, paginis eorum superioribus ad caulis latus superius spectantibus, oblonga obtusa obtuseve acuta, apicibus sursum curvatis, statu sicco arcte involuta, margine inferne ad caulis latus superius sinuato-incurvo, ad latus, inferius appressa imbricata, ubique limbo angusto cartilagineo pallidiore superne indistincte serrulato integerrimove circumducta, nervo concolori ætate rufescente sub summo apice evanido, cellulis parvis rotundatis utraque pagina papilliferis inde subobscuris viridibus; perichætia e latere caulis superiore orientia, basi radiculosa, foliis erectis ovato-lanceolatis basi truncatis apice acuminatis, vaginulam crassam filis elongatis pellucidis barbatam vix tegentibus, cellulis elongatis areolatis; pedunculus elongatus, crassus, superne trigonus; theca erecta, ob-

longa, sicca infra os plicata, gymnostoma? basi collo sensim angustato, calyptra angusta lævi pallida filis paucis elongatis pilosa; planta mascula gracilior, floribus parvis gemmæformibus, antheridiis pluribus paraphysibus æquilongis immixtis repletis.

Hab. Tutuila, on a Cocoanut-tree a little inland, Fangasâ Bay (1–2 ft.). No. 43.

Growing in extensive thin mats of a dull green colour, the stems everywhere closely attached to the bark or stone by the abundant rusty-brown roots. The leaves, when dry, uniformly closely rolled inwards towards the stem; in the wet state, from the shortness of those leaves arising from the upperside of the stem, the foliage appears compressed.

This genus agrees nearly with *Rhacopilum*, and must be arranged in the same natural family with it.

THYRIDIUM, gen. nov.

Caulis repens. Rami erecti, apice fructiferi. Folia basi cellulis hyalinis a superioribus conspicue diversis areolata. Theca æqualis, lævis. Peristomium duplex, externum dentibus 16, internum ciliis totidem, membranæ parum exsertæ impositis, conniventibus, nullisve. Calyptra latere fissa, cuculliformis.—*Codonoblepharum*, Dozy et Molk. Musc. Archip. Ind. p. 95, t. 33. *Calymperes* et *Syrrhopodon* auctorum ex parte.

The group of mosses here proposed to be separated from *Calymperes* and *Syrrhopodon* contains, beside those obtained by Mr. Powell, the East-Indian *T. repens*, Harvey (*Syrrhopodon*), *T. Jungquilianum*, Mitten, Bryol. Javan. t. 46 (*Syrrhopodon*), and some others as yet undescribed, all, with the exception of a single South-American species gathered by Mr. Spruce, found in the Indian archipelago and Pacific islands. From *Codonoblepharum*, Schw., founded on *C. Menziesii*, *Thyridium* differs in its creeping stems and in the structure of its leaves being similar to that of *Calymperes* and *Syrrhopodon*.

T. CONSTRICTUM, *Sull. Amer. Expl. Exp.* p. 6, t. 3. f. A.

Hab. Tutuila, on trees. No. 49.

Remarkable for its tristichous leaves; the fruit is still unknown.

T. LUTEUM, sp. n. Rami elongati; folia a basi brevi erectiore, ad insertionem constricta, superne parum latiora, patentia, sicca contorta subsecunda, linearia, elongata, sensim acuminata, nervo percurrente, margine undulata, serrulata, limbo inferne latiore, infra apicem evanido, cellulis hyalinis spatium parvum occupantibus, reliquis omnibus

parvis anguloso-rotundatis obscuriusculis, papillis inconspicuis parietibus pellucidioribus; perichætialia erectiora, caulinis similia; theca in pedunculo brevi, cylindracea.

Hab. Tutuila. No. 106. Ovolan, Figi Islands, on stones in the mountains, *Milne.*

A little more slender than *T. fasciculare*, with narrower leaves, scarcely dilated at the base, and when dry more loosely contorted and subsecund.

T. FASCICULATUM, *Hook. et Grev.* (Syrrhopodon), *Schw.* t. 299.

Hab. Tutuila, on cocoanut-trees near the sea-level. No. 112.

The branches of this fine species are from 1 to 3 inches long; and the plant appears to grow in large tufts. The fruit has only been seen on Dickson's original specimens. The calyptra is long; and although it may clasp the base or neck of the capsule as it does in some species of *Syrrhopodon* occasionally, it is very different from the plicate calyptra of *Calymperes.*

T. CRASSINERVE, sp. n. Rami humiles, dense cæspitosi; folia a basi dilatata erecta subrotundata, subito contracta, patentia, oblonga, apice obtusa obtuseve acuta, nervo infra apicem abrupto, dorso lævi, interdum valde incrassato, marginibus integerrimis, limbo angusto subconcolori inconspicuo ultra folii medium producto, cellulis hyalinis partem folii rotundatam erectam totam occupantibus, superioribus rotundatis obscuris minute papillosis; folia anomala apice longiora acuminata, corpuscula septata in glomerulis satis magnis ferentia.

Hab. Tutuila, on bark. No. 129.

Branches 3 or 4 lines high. Leaves short, incurved when dry. In size this species agrees with *T. repens* of the East Indies.

CHÆTOMITRIUM FRONDOSUM, sp. n. Rami elongati, ramulis brevibus irregularibus pinnatim ramosi; folia compressa, lateralia, patentia, oblonga, sicca longitudinaliter undulata, breviter acuminata, superne infra apicem excavata, margine apiceque planato flexuoso denticulatis, illo a medio usque ad basin anguste reflexo integerrimo, nervis brevibus, cellulis angustis dorso versus folii apicem finibus aculeiformibus exstantibus; perichætialia conformia, plicata, superne denticulis ciliata; pedunculus elongatus, basi nudus, superne setulis divaricatis vestitus; theca oblonga, inclinata, ætate pendula, operculo subulato; calyptra setis brevibus obtecta.

Hab. Tutuila, on trees by the ascent to Matafao (1500–2000 ft.). No. 68.

Pale, shining, straw-coloured, growing in loose tufts, the branches about 2 inches long. This fine species differs from *C. speciosum*, Sull. Amer. Expl. Exped. p. 23, t. 23, in its elongate pinnate branches and setose fruit-stalk.

C. DEPRESSUM, sp. n. Caulis repens, ramis brevibus dense insertis pinnatus, depresse cæspitosus; folia patentia, anguste ovato-lanceolata, acuta, parum concava, margine inferne anguste reflexo serrulato; ramea lineari-lanceolata, excavata, marginibus recurvis serrulatis, apice plana, cellulis angustis finibus prominulis papillosa, nervis brevibus; perichætialia majora, erecta, lanceolata, sensim acuta, profunde plicata, marginibus creberrime denticulatis; theca in pedunculo breviusculo rubro papilloso scabro, ovalis, inclinata, collo elongato, ore inæquali, operculo longe subulato; peristomium internum processibus angustis perforatis fuscis in membrana ad tertiam partem dentium longitudinis exserta insidentibus; calyptra apice setosa, basi ramentis barbata.

Hab. Tutuila, trees in low shady woods. No. 81. Very rare, only once found.

Near to *C. rugifolium*, Sull. Amer. Expl. Exped. 1859, p. 23, t. 22 (*Holoblepharum*); but the seta is not hispid, and the habit appears to be more depressed.

CALLICOSTELLA PAPILLATA, *Mont. Ann. des Sc. Nat.* 1845, p. 93 (Hookeria).—Hookeria oblongifolia, *Sull. in Proceed. Amer. Acad. of Arts and Sc.* 1854.

Hab. Tutuila, on trees by the ascent to Matafao (1500–2000 ft.). No. 69.

CALYPTOTHECIUM, gen. nov.

Caulis primarius repens, ramos elongatos liberos basi substipitatos inde ramulis breviusculis bipinnatos ex apicibus productis proliferos prodens. Folia lata, plus minus compressa undulataque, cellulis angustis areolata, nervo debili evanescente. Fructus e partibus ulterioribus ramorum ramulorumque oriens. Theca æqualis, fere sessilis, perichætio immersa, peristomio processibus angustis in membrana brevi insidentibus apices dentium superantibus. Calyptra parva, basi integra.

C. PRÆLONGUM, sp. n. Dioicum; rami rubri, basi simplices, superne in frondem elongatam plumæformiter sensim decrescenter pinnatam divisi; folia subbifaria, compressa, transverse undulata, lateralia, patula, e basi cordata, auriculis circinatis undulatis caulem amplectentibus, ovato-ligulata, apice acuta subacuminatave, plus minus complicata, in ramulis excavata, omnia nervo angusto tenui ad medium producto vel abbreviato fere obsoleto, marginibus apicem versus serrulatis, cellulis superioribus elongatis, basi paucis latioribus, parietibus hic illic interruptis; perichætialia interna erecta, a basi ovali convoluta, subulata, nervata, apicibus subintegerrimis; theca ovalis, immersa, peristomio dentibus angustis, processibus filiformibus æquilongis, in membrana brevissima impositis.

Hab. Upolu, on trees. No. 102. Also in the Society Islands, *Bidwell in herb. Hooker.*

Branches a foot long; sometimes they are even a foot and a half, the lateral branchlets rarely exceeding an inch in length. Leaves green and shining.

This fine moss comes near to the *Hypnum duplicatum*, Schw. t. 279; but its leaves are more widely auriculate, and the perichætial leaves more closely convolute; with a few other species found in India and the Indian archipelago, it forms a small group having at first sight so much the appearance of the larger species of *Neckera* as to be easily confounded with them.

PTEROBRYUM CYLINDRACEUM, *Mont. Ann. des Sc. Nat.* 1848, p. 109.
Hab. Tutuila, near Letaumata (1000 ft.). No. 72.

DISCOPHYLLUM, gen. nov.

Caulis procumbens repensve, ramos in cæspitem depressum congestos emittens. Folia diversiformia, nervo singulo evanescente, cellulis rotundo-hexagonis areolata. Fructus e caule oriens. Theca in pedunculo elongato, ovalis, horizontalis pendulave, operculo acuminato rostrato, peristomio dentibus externis stratu cellularum exteriore inferne per lineam mediam divisis, processibus internis carinatis in membrana insidentibus. Calyptra basi multifida.

D. FLAVESCENS, sp. n. Pusilla, cæspitosa; folia fere omnia magnitudine et forma similia, subcompressa, obovata, apiculata, marginibus flexuosis, limbo tenui circumductis, nervo angusto ad ½ folii longitudinis producto, cellulis hexagonis pellucidis.

Hab. Upolu, on trees. No. 93.

In size similar to *D. adnatum*, H. f. et W., of New Zealand, but less compressed and of a yellow colour. The leaves are not perceptibly different in size and form on the upperside, as is so generally the case in the allied species. In habit it appears to correspond with *D. Dicksoni*, H. f. et W. (*Hookeria*).

DISTICHOPHYLLUM, Dozy et Molk.

D. VITIANUM, *Sull. in Proceed. Amer. Acad. of Arts and Sciences*, 1854.

Hab. Tutuila and Upolu, on stones and roots of trees (1000 ft.). No. 94.

LEUCOBRYUM, Hampe.

Sect. *Pegophyllum*.

Fructus in ramulo brevi, lateralis.

L. SANCTUM, *Hampe, Bryol. Javan.* t. 12.
Hab. Upolu, on trees (1200 ft.). No. 82.

L. RUGOSUM, sp. n. Folia dense inserta, pentasticha, a basi erectiore excavata, lanceolata, sensim longe angustata, marginibus incurvis canaliculata, acuta, patentia, dorso parietibus cellularum prominentibus subdentata, cellulis basi in parte erectiore ad margines in seriebus circiter 9–10 dispositis (folii lamina), in parte superiore obsoletis.

Hab. Manua, on trees. No. 101.

Like *L. sanctum* in size and habit, but a little more rigid, and with its leaves tinged with a pale yellowish green. From *L. pentastichum*, Dozy et Molk. Bryol. Javan. t. 15, it differs in its leaves being narrowed above and below, with a more evident border of the lamina.

LEUCOLOMA TENUIFOLIUM, sp. n. Folia sensim a basi elliptico-lanceolata longe angustata, attenuata, nervo pallido usque ad apicem minute denticulatum a folii lamina distincto, cellulis in folii medio minutissimis rotundatis obscuris, dorso minute papillosis, latitudinis folii $\frac{3}{4}$ occupantibus, cellulis ad folii margines elongatis angustis, limbo hyalino usque ad folii longitudinis medium producto, cæterum *L. molli* simile.

Hab. Tutuila and Upolu, on trees. No. 98.

This species appears to have longer leaves than *L. molle*, C. Müller, Bryol. Javan. t. 53 (*Dicranum*), and the cells next the nerve in the middle of the leaf about half as large as in that species, and less evidently papillose on the back.

CALOMNION DENTICULATUM, sp. n. Folia lateralia, omnia superficiebus superioribus ad idem latus spectantia, patentia, oblonga, nervo in mucronem excurrente, marginibus a medio ad apicem usque denticulatis; folia media appressa, dimidio breviora, suborbiculata, superne dentata; folia omnia cellulis parvis rotundatis interstitiisque pellucidis; perichætialia longiora, spathulata lineari-lanceolataque; theca in pedunculo gracili, ovalis, erecta, operculo subulato. Planta mascula flore apicali gemmiformi.

Hab. Upolu, on trees. No. 103.

Corresponding in size, habit, and appearance with *C. lætum*, Hook. f. et Wils. Fl. New Zealand, pl. 87. f. 5, but with denticulate leaves, and the capsule appears to have a smaller mouth. Both species of this curious genus are remarkable for their elegant form and the firmness of their foliage.

HYPNODENDRON SAMOANUM, sp. n. Folia compressa, quinqueseriata, seriebus duabus inferioribus majoribus, superioribus tribus minoribus, omnia ovato-lanceolata, acuta, planiuscula, nervo superne dorso denticulato percurrente, marginibus denticulis brevibus duplicatis serratis, cellulis elongatis finibus dorso prominulis punctulato-papillatis.

Hab. Tutuila, on trees and rocks in the beds of gullies (100–2000 ft.). No. 107.

Similar to *H. arcuatum*, Hedw. Sp. Musc. t. 62, which is frequently much larger than depicted in that figure,—but differing (as well as from *H. Junghuhnii*, C. Müller, Syn. ii. p. 506, Bryol. Javan. t. 231) in its areolation composed of wider cells, and in the duplicate teeth of the margins of the leaves.

H. ARBORESCENS, *Mitten in Journ. of the Proceed. Linn. Soc.* 1859 (Trachyloma).
Hab. Upolu, decaying tree near Lanutoo (2000 ft.). No. 111.

PTYCHOMNION ACICULARE, *Schur.* (Hypnum), *Hook. f. et Wils.*
Hab. Manua, on trees. No. 108.

HYOPHILA SAMOANA, sp. n. Pulvinatim cæspitosa; caulis humilis; folia patentia, a basi brevi contracta ovali-oblonga, apice obtuse acuta, nervo percurrente, marginibus apice crenulatis integerrimisve, ad latera folii inflexis, cellulis superioribus minutis rotundatis viridibus, basalibus paucis oblongis pellucidis majoribus.
Hab. Tutuila, on trees. No. 123.

Similar to *H. Javanica*, Nees et Blume, but more robust, and the leaves towards their apices more or less distinctly crenulate and not so acute.

SPIRIDENS ARISTIFOLIUS, sp. n. Caulis elongatus, superne plus minus ramosus; folia a basi ovali inferne erecta caulem amplexante, recurva, patentia, subulata, sensim in acumen aristiforme subteres attenuata, nervo superne percurrente, inferne paulo supra basin obsoleto, marginibus incrassatis, dentibus aculeiformibus ad apicem aristæ minoribus brevioribusque, serratis, incrassatis, lamina folii supra basin erectam fasciis e seriebus duabus cellularum compositis striata et transversim rugulosa; perichætialia a basi ovali inferne enervi convoluta, superne in aristam thecam oblongam curvatam superantem producta, apice remote dentata; operculum subulatum; peristomium dentibus pallidis angustis elongatis, internum processibus parum brevioribus in membrana ad ½ dentium longitudinis exserta impositis.
Hab. Tutuila and Upola: No. 127. Also found in the Figi Islands by Milne.

Stems from 6 to 18 inches high, more or less divided and branched above, simple below. Leaves pale green or yellowish, the younger slightly glossy, the older fulvous and dull; those from the middle of the stem are ½ an inch long, the long points remaining straight when dry; the lamina of the leaf is marked with bands which, on cross section, are found to consist of double layers of cells as in the thickened margin. The capsule is about 2 lines long, brown, and, after maturity, shining.

This fine Moss corresponds very nearly with *S. Reinwardti*, Nees,

Bryol. Javanica, t. 194, but differs in the points of its leaves being attenuated into a bristle from the confluence of the thickened margins with the nerve.

S. CAPILLIFERUS, sp. n. Caulis elongatus, simplex vel versus apicem parce ramosus; folia ob fragilitatem maximam fere omnia infra medium diffracta, a basi rotundata erecta amplexante, recurva, patula, subulata, longissime capillari-attenuata, apicibus incurvis erectis, nervo superne percurrente paulo supra basin obsoleto, marginibus latiuscule incrassatis, supra basin erectiorem denticulis brevibus approximatis serratis, in acumine capillari remote indistincte serratis, lamina folii supra basin fasciis pluribus striata.

Hab. Tutuila, on tree-ferns (1500–2000 ft.). No. 128.

Stems from 6 to 12 inches high, with one or two short branches near their tops, or undivided. Leaves at the apices of the stems straw-coloured, the lower ones fulvous, and almost all of them broken off below the middle of the recurved part; towards and at the apices of the stems a few remain entire; these are rather more than an inch in length: the noble appearance of this fine species must, when unmutilated, far exceed that of the *S. longifolius*, Lindbg., MS., from the Philippine Islands.

DREPANOPHYLLUM SEMILIMBATUM, sp. n. Caules in cæspitem aggregati, dichotome divisi, erecti? folia tetrasticha, bifaria, distiche compressa, nervo rufo in mucronem brevissimum excurrente, lamina folii latere superiore (i. e. caulis apicem versus) ambitu semiorbiculari, limbo cartilagineo incrassato rufo superne subcrenulato integerrimove, fere ad apicem usque continuo marginata, lamina latere inferiore multo angustiore immarginata apice subcrenata basin versus angustata et decurrente (ambitu igitur folii ovali-oblongo acuto, nervo uno lateri propinquiore), cellulæ quadratæ rotundatæque firmæ pellucidæ læves; folia perichætialia magis oblonga, acutiora, cæterum caulinis similia.

Hab. Tutuila. No. 135.

Stems an inch high, dark brown, stiff. Leaves small, increasing in size upwards on the innovations. Some of the branches have their upper leaves reduced in size, appressed, and accompanied by thick red radicles.

ŒDICLADIUM, gen. nov.

Caulis repens, ramis erectis in cæspites latos congestis. Folia undique turgide imbricata, subenervia, cellulis angustis elongatis (alaribus brevibus) areolata. Fructus ad ramorum latera. Theca longe pedunculata, peristomio simplici externo vel (interno plus minus evoluto) duplici. Calyptra angusta, latere fissa.

Œ. INVOLUTACEUM, sp. n. Rami elongati, ramosi, cæspitosi; folia patentia, laxe imbricata, in ramorum apicibus cuspidato-imbricata, oblongo-ovalia, marginibus superne involutis, apice subito in acumen elongatum angustum curvatum serrulatum producta, cellulis elongatis angustis (alaribus conspicuis suboblongis) fuscis; perichætialia erecta, interna ovalia subulato-attenuata serrulata; theca in pedunculo elongato, ovalis, parva, horizontalis, basi rugulosa, operculo rostrato; peristomium internum ciliis singulis?

Hab. Tutuila. No. 140.

Very nearly allied to *O. rufescens*, Hornsch. (*Leucodon*), but with the leaves not teretely imbricated, and their margins more involute.

The position of these species is not yet clearly ascertained; but they have no affinity to *Leucodon* as understood by the species similar to *L. securoides*, Schw. In *O. rufescens* the peristome appears to be simple, the teeth very thin, with slight trabeculæ on the internal side.

In both species the capsule is small, and the seta very slender for the size of the moss.

Only one old capsule remained on the Tutuilan specimens; so that the structure of the peristome must remain somewhat doubtful.

EXPLANATION OF PLATES V. & VI.

A. *Meteorium intricatum*, p. 171.

1, Branch, of the natural size: 2, leaf of the same; 3, leaf from the ramuli; 4, perichætium and capsule; 5, portion of the peristome: 2–5 magnified.

B. *Meteorium æruginosum*, p. 171.

1, Branch, of the natural size: 2, portion of the same; 3, leaf detached; 4, perichætium and capsule; 5, portion of the peristome; 6, calyptra (young): 2–6 magnified.

C. *Pelekium velatum*, p. 176.

1, Stem, of the natural size: 2, portion of a branch with leaves; 3, portions of ramulus; 4, leaf from the stem; 5, portion of stem with fruit, calyptra, and male flower; 6, perichætial leaf detached; 7, capsule; 8, portion of peristome: 2–8 magnified.

D. *Powellia involutifolia*, p. 187.

1, Plant, of the natural size: 2, portion of stem with leaves, as seen from the upperside; 3, perichætium and young seta with calyptra; 4, perichætial leaf; 5, small flower; 6. capsule past maturity: 2–6 magnified.

E. *Drepanophyllum semilimbatum*, p. 194.

1, Stem, of the natural size; 2, portion of the same with leaves, magnified.

Observations on *Thlaspi alpestre* (L.).

By JOHN WINDSOR, F.L.S., F.R.E.S., &c.

[Read November 21, 1867.]

THLASPI ALPESTRE is a plant which, as the late Sir J. E. Smith has well remarked in 'English Botany,' p. 81, 1st ed., has not always been well understood by botanists; and, even at the present day, doubts may be entertained whether its different forms, varieties, or subspecies, as occurring in Britain, have been fully established.

I have on various occasions collected and compared the Matlock and the Settle or Malham plants (the latter again on June 22, 1867), and am induced to regard them as different forms, or rather subspecies, of *Thlaspi alpestre*. Smith, in 'English Botany,' also in his 'Flora Britannica,' p. 686, and in his 'English Flora,' vol. iii. p. 172, describes one form only.

In Babington's 'Manual of British Botany,' three forms are described; and I observe that in the last or 6th edit. he continues to give just the same description of them as before, viz.:—

1. *Thlaspi alpestre*, having the style equalling or exceeding the notch, and the pouch presenting an oblong-obovate form.

2. Var. *T. occitanum* (Jordan), having its pouch of a triangular-obcordate form, from its lobes somewhat diverging—the style much projecting, and the leaves being often slightly dentate.

3. *Thlaspi virens* (Jordan), having an obovate pouch with a broad shallow notch, and a much-projecting style. I may note here that I have found the style in each form of about equal length, but they are often absent or fallen off.

With regard to the first form, named *alpestre*, I have not collected it in the stations assigned to it; but judging by two specimens I possess from Teesdale, and comparing them with the Matlock plant, I can discover no decided differences, except that the former seems a little taller. They both appear glaucous in colour; but this character is not so apparent in dried plants as in recent ones; the pouches appear to be of the same form, and the styles about equally projecting.

With regard to the next two forms, I consider that they present differences entitling them to be considered distinct, or varieties or subspecies. The figure 81 in 'English Botany,' 1st edit., is a very good representation of the Matlock plant, as to its general aspect and glaucous hue; but the pouch, as afterwards

noticed by Smith himself, is represented, perhaps, as too obcordate, whilst it should be oblong-obovate. However, some of my specimens from Matlock present the obcordate form, showing that this character, although mostly a good one, is somewhat variable. This obcordate form of the pouch certainly appertains more to the Settle or Malham plant, named *occitanum* (Jordan), than to the Matlock one, named *virens* (Jordan). I find, on examining the pouches of the Teesdale plant (*alpestre*, Bab.), that the same variations occur, and that they have not their extremities always rounded, but sometimes present the obcordate form, so marked a character of the Settle or Malham plant.

In a specimen I have from near Namur, Belgium, the pouches generally present this obcordate form; and it seems altogether like the larger specimens of the Malham plant.

As to the aspect or habit of the different forms of *Thlaspi alpestre*, the stature of the Matlock plant is usually higher and more erect than that of the Settle or Malham one, and the Teesdale form agrees with the former. As to the colour or hue of the plant, it is in the Matlock form (as described and figured in 'English Botany,' 1st edit.) strikingly glaucous; on the other hand, in the Malham form, it is, as far as I have seen, always green and totally destitute of glaucescence. Smith does not allude to the green, nor Babington to the glaucous hue; yet I think they are important distinctions.

I have specimens of both forms from Teesdale; and it is possible that the green form may grow near Matlock; but I have not yet met with it there.

It would seem, then, that there are sufficient marks of distinction to constitute at least two varieties or subspecies of *Thlaspi alpestre*; and if so, I would venture to ask whether the names lately assigned to them are appropriate.

To the Matlock form, distinguished chiefly, so far as I have yet found it, by its *glaucous* hues and the oblong-obovate form of its pouches, along with its generally taller growth, the name *virens* has been applied.

To the Settle or Malham form, characterized by its *green* hue, its shorter and less erect stature, and especially by its obcordate pouches with divergent lobes, a more distinct notch, and a prominent septum or ridge (a prolongation of the pedicel) between them, the name of *occitanum*, or more lately *occitanicum* (Jordan), has been applied. Both these names seem objectionable, inasmuch as the plant met with at Matlock, called *virens*, is

decidedly glaucous, and the plant met with in Craven, &c., named *occitanicum* (Jordan), is found in so many places besides *Occitania* (Languedoc), in France. Sir J. E. Smith in 'English Botany,' vol. vii. p. 441, well observes that "specific names taken from the local distribution of plants are generally exceptionable."

It is not, however, desirable to change the adopted names of plants, unless they are manifestly inappropriate; otherwise I should take the liberty of proposing that the appellation of *Thlaspi alpestre*, species or subspecies *glaucescens*, should be given to the Matlock &c. form, and that of *Thlaspi alpestre*, species or subspecies *virens*, to the Craven (Settle and Malham &c.) plant.

Note A.

The only exception to the glaucous colour of the *Thlaspi alpestre* found near Matlock &c., is in the rosette of root-leaves, especially in the lowest of these, which are sometimes green, thus contrasting distinctly with the glaucescence of those above and of the rest of the plant. This is scarcely shown in the excellent figure of it in the first edition of 'English Botany.'

On revisiting Matlock and the neighbouring Bonsall on July 25, 1867, I searched in vain for the green form occurring near Malham and Settle &c. On examining and comparing again the silicles of these two forms, I find my previous account of them confirmed. In the Matlock form they are (in their earlier state) mostly obcordate; but on advancing to full maturity they become somewhat more oblong, and the two sides or lobes are in such close apposition as to leave little or no intervening notch. In the Malham form the pouches are larger and the lobes more divergent; hence they become more distinctly obcordate, and the notch more decided; but the projecting style is of about the same length in both forms. Whether there are in Britain any more than these two forms, species, or subspecies of what has been called *Thlaspi alpestre*, I have hitherto seen no specimens enabling me to form an opinion.

Note B.

In conclusion, it may not be inappropriate here to add that *Arenaria verna* seems to be generally associated with both forms of *Thlaspi alpestre*, and that they all mostly seem to indicate the presence of lead or calamine in the soil where they are found.

There are doubtless exceptions to this rule, as the seeds may

be blown or carried to a distance, and thus we find scattered, and sometimes solitary, specimens of all of them.

I have also again this summer (1867) found both the forms of *Thlaspi* in those different and distant localities, viz. at Malham and at Matlock, accompanied by a great abundance of *Cerastium semidecandrum*.

On the *Fagus Castanea* of Loureiro's 'Flora Cochinchinensis;' with descriptions of two new Chinese *Corylaceæ*. By H. F. Hance, Ph.D., &c.

[Read November 21, 1867.]

The tree erroneously taken by Loureiro for the European Chestnut, though referred to various species, on more or less plausible grounds, by different writers, has, up to the present time, remained unknown to most, if not all, European botanists. Willdenow, in his edition of Loureiro's book (ii. 699, Berol. 1793), first expressed a doubt of the accuracy of that author's determination, on account of the leaves being described as entire at the base, and the involucre as monocarpous. Sprengel, in the third volume of the 'Systema Vegetabilium' (Götting. 1826), relying on these differences, characterized Loureiro's species (without knowing it) as new, under the name of *Castanea chinensis*. Bunge, in 1831 (Enum. Pl. Chin. Bor. p. 62), suggested the probability of the Anamese plant being identical with his own *Quercus chinensis*; but as this, which is a near ally of *Q. serrata*, Thbg., has the leaves canescent beneath, Siebold and Zuccarini (Flor. Japon. fam. nat. sect. alt. p. 225) showed that this opinion was untenable. In 1850, the late Prof. Blume (Mus. Lugd.-Bat. i. 286) described, under Sprengel's name, a Chestnut said to have been introduced from China into Japan, where it is recorded only as in cultivation. In the 'Botany of the Voyage of the Herald' (1857), Dr. Seemann records *C. chinensis* as a native of Hongkong, adducing as synonyms *C. tribuloïdes*, Lindl., and *Quercus Eyrei*, Champ., and marking these and Loureiro's names with notes of admiration. Three years later, in his admirable 'Flora Hongkongensis,' Mr. Bentham, by the recognition of *Quercus Eyrei*, tacitly excludes *C. tribuloïdes*, and remarks, "I know not on what grounds Seemann refers the *Q. Eyrei* to *Castanea chinensis*, Spr., with which it appears to me to have no connexion in foliage, inflorescence, or flowers." From this latter remark, and from Dr. Seemann's "!," I suppose I may conclude that

more or less perfect specimens of Loureiro's original plant exist in the British Museum or elsewhere. By some singular misapprehension, Prof. Miquel (Ann. Mus. Lugd.-Bat. i. 119, anno 1863), whilst excluding *Q. Eyrei*, Champ.,—the very tree taken by Seemann for Loureiro's species,—admits the latter as a native of Hongkong, regarding it, under the name of *Castanopsis ferox*, Spach (not quoted by A. DeCandolle), as the same with *C. tribuloïdes*. Finally, in 1864, M. Alphonse DeCandolle, in his revision of the order (Prodr. Syst. Reg. Veg. xvi. sect. post. pp. 105–116), relegates both *Q. Eyrei* and *Castanea chinensis* amongst the "species dubiæ," observing that a leaf of the plant Blume had taken for the latter proves it to be quite distinct from *C. tribuloïdes*. That Blume's tree, of which I have no knowledge, is different also from *C. chinensis* is evident from the leaves being described as downy beneath and setaceo-serrate, and the branchlets as tomentose; whilst the distinct assertion of Bentham, the smaller leaves, shorter petioles, and the absence of any reference to aculei on the involucre would seem to prove the same of *Q. Eyrei*. It must be through some unaccountable error that the latter is reported, on the late Colonel Champion's authority, to be "abundant in the Wong nei chung wood." Neither the late Dr. Harland nor myself ever succeeded in finding a single tree, though we repeatedly searched the woods there and elsewhere in Hongkong, with that special object; nor have I ever seen specimens collected by the various botanists or amateurs who have explored these woods; so that, after nearly a quarter of a century's sojourn in southern China, the species is still quite unknown to me.

In the autumn of 1866 I had the advantage of making an excursion, with Mr. Sampson, from Canton up the North River, to a distance of about 130 miles into the interior of the province of Kwangtung; and we then detected, in the dense forest clothing the narrow gorge of the Tsing-yune Pass, a fine Chestnut, which I have now, after careful examination, no hesitation in regarding as Loureiro's species. My reasons are:—1, that it agrees perfectly with his diagnosis, so far as that extends; 2, that a Cochinchinese tree is, from the geographical position of Anam, more likely to be identical with one restricted to south China than with one extending northwards. In fact, even of the ten oaks (including *Castanopsis*) recorded from Hongkong, two only, *Quercus thalassica* and *Q. salicina* are known to occur as far north as Che-kiang and in Japan; whilst there is no evidence that the only Cochinchinese species, *Q. cornea*, does so, though

this is, of course, not impossible. But all the species found about the latitude of Peking, and the greater number of the Japanese, are quite distinct from those of southern China, and might be expected *a fortiori* to be so from those of Cochinchina, the tropical character of whose forests may be fairly inferred from the circumstance that the Report of a Commission appointed in 1865 by the "Comité Agricole" enumerates eight *Dipterocarpaceæ* as furnishing valuable timber.

I subjoin a diagnosis of the tree, and also of two undescribed *Corylaceæ* in my herbarium, merely remarking that I have admitted the genus *Castanopsis* in deference to M. DeCandolle's decision. Had I consulted my own judgment, I should have named this Chestnut *Quercus Loureirii*,—a renewed consideration of the subject since my article on *Quercus* and *Castanea* was published in the first volume of Dr. Seemann's 'Journal of Botany,' aided by a careful perusal of what has been written by Miquel, Oudemans, Kotschy, and especially A. DeCandolle, and a partial study and examination of most of the Asia-Minor forms, many from Japan, and a fair number from the Indian archipelago, having lead me to the conclusion that neither *Castanea* nor *Castanopsis* are to be distinguished from *Quercus* as genera, in the sense in which I hold the term; and such, I should expect, would be the views of the authors of the 'Genera Plantarum.'

CASTANOPSIS CHINENSIS, mihi. Arbor 30–40-pedalis, ramis junioribus glaberrimis, foliis petiolo pollicari suffultis e basi cuneata subovato-lanceolatis acuminatis a medio ad apicem distanter calloso-serratis subcoriaceis glaberrimis 4–5 pollices longis parte latissima 1½ poll. latis in utroque latere 8–12-costulatis atque insuper reticulatis, costulis subtus præcipue prominulis, amentis . . . . . ., spicis fœmineis folio æqualibus, fructibus junioribus globosis monocarpis sparsis v. aggregatis fulvo-velutinis aculeis in verticillos 3 vel 4 sinuosos dense seriatis rectis subulatis rigidis sæpius compositis v. basi connatis cinereo-sericeis superne glaberrimis brunneis echinatis.

Hab. In silvis densis circa cœnobium Buddhisticum Fi-loi-tsz, ad fauces Tsing-yune fl. (North River), prov. Cantoniensis, d. 19 Sept. 1866, fructibus immaturis onustam, invenerunt Sampson et Hance. (Exsicc. no. 13785.)

C. echidnocarpa, A. DC., is, I think, the closest ally of this plant, though the young fruits most nearly resemble those of *C. tungurrut*, A. DC. I am much inclined to believe that a nut occasionally sold for the table in the Canton markets is referable to this species. It is ovoid-turbinate, 10–11 lines long, of a

bright chestnut-colour, with cinereous appressed silky pubescence surrounding the acute apex; the rather large *hilum carpicum*, neither elevated nor depressed, is paler, rugose, and girt by a blackish, quite smooth areole; in taste this fruit precisely resembles our common chestnut.

QUERCUS (LEPIDOBALANUS) FABRI, n. sp. Ramulis angulatis sulcatis cinereo hispidis, foliis subsessilibus obovatis obtusis paulo infra medium in basin obtusam cuneatis grosse sinuatis lobulis utrinque circiter 7 rotundatis costulis vix excurrentibus apiculatis supra parce pilosis infra dense fulvido stellato-tomentosis costa utrinque hirsuta, fructibus sessilibus solitariis (? semper), cupulæ late hemisphæricæ 2 lin. longæ 3½ lin. latæ squamis imbricatis lanceolatis obtusis arcte appressis parce tomentellis summis incurvis cupulam non superantibus, glande oblonga glaberrima 7 lin. longa apice tomentosa styli basi apiculata.

Hab. In prov. Kiang-su coll. cl. C. Fabre-Tonnerre, M.D., Francogallus. (Exsicc. no. 10236.)

Very similar in foliage to *Q. dentata*, Thbg., (though the leaves are rather less broad towards the apex,) but quite different in its much smaller, oblong (not ovate) fruit, and in the cupule. From this, as I have already said elsewhere, *Q. obovata*, Bge., is certainly in no wise distinguishable. *Q. mongolica*, Fisch., which I have not yet seen, recedes, according to the description, by its glabrate branchlets and leaves, its larger fruit, and by its cupule being, according to Ruprecht (Die ersten botan. Nachr. üb. d. Amurlande), 'squamis gibbosis muricata.' In his learned dissertation 'De l'espèce dans les Cupulifères,' M. Alph. DeCandolle expresses a suspicion that *Q. obovata* will one day be united with *Q. robur*; but, on account of the very dissimilar structure of its cup, it appears nearer akin to *Q. vallonea*, Ky., *Q. Brantii*, Lindl., and *Q. oophora*, Ky. Our species, however, notwithstanding its leaves, is, from the size and shape of the cup-scales, far more closely allied to *Q. robur* than to *Q. dentata*. In all the Oaks I have examined, including the vast collections brought by Kotschy from Western Asia, I have found the *hilum carpicum* ("cicatrix affixionis," Ky.) to afford characters, as respects colour, form, and elevation above or depression below the base of the nut, uniformly constant in each species. These characters, already in part carefully noted by Kotschy in his splendid, but, so far as classification is concerned, not over-philosophical work 'Die Eichen Europa's und des Orients,' have been altogether neglected by A. DeCandolle.

CARPINUS TURCZANINOVII, n. sp. Arbuscula circ. 10-pedalis, ramulis junioribus sericeo pilosis, foliis coriaceis 1–1½-pollicaribus incl. petiolo 1½–2-lineali exacte ovatis acutis basi æqualiter subcordatis subduplicato-serratis serraturis callosis supra glabris nitidulis venisque primariis impressis notatis infra venulis conspicue et minute reticulatis præter venas primarias validas 10–12 paria pilosas atque in axillis fovea glandulosa lanata notatas glabris, bracteis fructiferis coriaceis pallide viridulis valide 5–6-nerviis subfalcato-oblongis latere convexo 7–8-dentatis altero apicem versus circiter 2–3-dentatis basi parum inflexis, nuculis ovoideis 5–7 lineas longis 10-costulatis glanduloso-granulosis sesquilinearibus.

Hab. In collibus ad occidentem urbis Peking sitis, m. Augusto 1865, coll. Dr. S. W. Williams. (Exsicc. no. 12681.)

This species (which is very near *C. duinensis*, Scop., from which, however, it is readily distinguishable by the thicker and stiffer texture of its more ovate, less conspicuously duplicato-serrate leaves, with woolly vein-axils beneath, and by its coriaceous, narrower, falcate-oblong, much less involute fruit-bracts, with far stronger and straighter nerves), though entirely overlooked by A. DeCandolle in his late recension of the order, is doubtless the plant enumerated by Maximowicz, in his 'Index Floræ Pekinensis,' without any trivial name or description, from Turczaninow's collections. I have therefore dedicated it to the memory of that botanist, who, by his writings and collections, has done much to throw light on the flora of north-eastern Asia.

Having examined three out of the four species placed in the genus *Distegocarpus* by M. Alph. DeCandolle, I entirely agree with the late Prof. Blume that they have no claim to be separated from *Carpinus*.

Note on the Stigmatic Apparatus of *Goodenovieæ*.

By GEORGE BENTHAM, Esq., F.R.S., Pres. L.S.

[Read December 19, 1867.]

MY attention was specially directed to the manner in which impregnation is impeded or facilitated in *Goodenovieæ*, by an observation of Mr. Darwin's that he believed that the impregnation took place at the base of the indusium, on the outside. This I could not understand, as in the genera *Scævola* and *Goodenia*, which I was then examining, I always found the exterior of the indusium perfectly smooth, without the slightest indication of the papillose structure of stigmatic surfaces, and, if covered with hairs, these hairs not even glandular, but of the same nature as the

hairs found in the interior of the corolla-tube of almost all *Goodenoviceæ.* When, however, I came to *Lechenaultia,* I observed a very different stigmatic arrangement, suggesting an explanation of Mr. Darwin's views; and I have since learnt from him that that was the genus upon which he had made the observation. I have now gone through the whole Order, analyzing every species, and, as far as can be judged from dried specimens, there seems to be considerable diversity in the impediments to impregnation opposed by the structure of the parts, as well as in the contrivances provided for overcoming these obstacles. The progress of development, however, can only be watched on the living plant; and it is in order to call to the subject the attention of any observers who may have any species in cultivation, and still more of those of our Fellows who may be resident in Australia, that I lay before the Society the peculiarities which I have observed.

In the majority of species, at the time the bud opens, the anthers have shed the pollen; the summit of the style is then near the anthers; but the stigma is perfectly dry, has not received its full development, and is evidently incapable of duly receiving the pollen. At a later period the stigma has become raised far above the anthers by the growth of the style, and has become otherwise variously guarded against the access of pollen. In most species of *Goodenia,* as stated in the 'Botanical Magazine' under *G. grandiflora,* t. 890, the cup-shaped indusium is at an early stage surrounded by the anthers and then perfectly open, with the young (as yet imperfect) stigma at the base. As the flower expands, the indusium, raised far above the stamens, is firmly closed and often further sheltered from external agency by the upper petals of the corolla closely arching over it. It is, however, always full of pollen; and when the flowering is perfected, the stigma has grown up, in many species, to the margin of the indusium, or forced itself just through its closed lips. It is supposed that the indusium thus collects the pollen as it passes through the anthers, and stores it carefully till the stigma is ready to receive it, which would be a contrivance for receiving fecundation from its own pollen. On the other hand, the stigma, when ready, appearing at or beyond the orifice, would indicate a provision towards the interchange of pollen with other flowers through insect or other agency. What really takes place can only be ascertained by the observation of the living plant.

In *Scævola* the process is generally more simple: the indusium is always more open and less sheltered by the corolla, but generally

deep, and the stigma small and more buried in it. In *Velleia* the indusium is very large, broad, and, when closed, curved in a semicircle, but not deep; the stigma does not appear to me ever to protrude, but is never far from the orifice. In *Calogyne Berardiana* the style is split into two through the indusium and stigma, each half of the indusium being a half-cup not joined on the inner edge, but flattened and closely covering the half stigma, just as if the *Goodenia* indusium and style had been cut through with a knife. In *Calogyne pilosa* the style is divided into three: instead of being slit down the centre, the slit is on each side of the central line; the two lateral branches have each a portion of the indusium, not joined on the inner edge, but closely pressed against a portion of the stigma, as in *C. Berardiana*; but they have left behind them the central portion of the indusium unjoined on both edges, but closely embracing the centre of the stigma. That this division of the style is not a separation of the carpellary leaves is proved by this *C. pilosa*, where the branches are three, whilst the carpellary leaves (rudimentary cells of the ovary, valves of the capsule, &c.) are, as in other Goodenovieæ, two only. It would seem, therefore, as if it were a provision in some measure connected with the duties of impregnation.

In *Dampiera* the summit of the style, when short in the bud, has the appearance of an ordinary peltate stigma, except that it is not yet papillose, flat and nearly circular, with the rudiment of the stigma across the centre. It soon rises, the margins are raised into a short almost 2-lipped indusium; but I do not find that it carries up any pollen with it; and the stigma does not assume the perfect appearance till the whole indusium and stigma has ensconced itself between the two upper petals, which closely embrace it by means of two thickened concave appendages, requiring some external agency to open them and give access to the pollen.

In *Leichenaultia* we have another modification: the indusium is usually described as broadly two-lipped, without any distinct stigma. The fact appears to be that the upper less prominent lip is stigmatic all over, inside and out, with a transverse band of short glandular hairs at its base outside, whilst the lower more prominent lip is smooth and glabrous, or with a tuft of rigid hairs. Perhaps this lower lip and the upper band of hairs are all that correspond to the indusium of other genera; and the so-called upper lip, outside of which impregnation may well take place, as observed by Mr. Darwin, must be regarded as the true stigma.

In giving these different modifications as characterizing the

different genera, I do not mean that they are uniform in all the species of each genus. Several species of *Goodenia*, in their corolla and style, approach more or less to *Scævola*; others have more or less of the auriculate upper corolla-lobes of *Dampiera*, although I have not observed these auricles so perfect and so well-closed over the indusium as in the latter genus. The rigid hairs, erect on the back of the indusium, reversed in the tube of the corolla, inflected on the margin of the auricles of some *Dampieras*, the cilia of the margin of the indusium in most *Scævolas* and *Goodenias*, all of which appear to act their part directly or indirectly in facilitating or impeding impregnation, are different in different species. The nectaries or saccate protuberances or spurs of the adnate corolla-tube in most *Goodenias* and *Velleias*, of use perhaps in attracting the necessary insects, are wholly wanting in other genera or species; and in this case, as in so many others, we cannot be too cautious in generalizing from the observation of single species.

Note on the *Isoëtes capsularis*, Roxb. By JOHN SCOTT, Curator, Botanic Garden, Calcutta. Communicated by Dr. ANDERSON, F.L.S.

[Read November 21, 1867.]

IN collecting the native plants of Bengal with a view to their introduction to the Botanic Gardens here, I had vainly searched the ponds and jheels in the neighbourhood of Calcutta for the *Isoëtes capsularis*, Roxb., never doubting (previously to consultation of his original description) that it was other than a veritable *Isoëtes*, as described and figured by Griffith in his 'Notulæ' (Cryptogamæ) and 'Icones Plantarum Asiaticarum.' On referring, however, to the description in the "Cryptogamous Plants of Roxburgh," Calcutta Journal, vol. 4, I at once saw that the plants respectively figured and described by Roxburgh and Griffith had no affinity whatever. Roxburgh's plant is clearly phanerogamous (the description sufficiently characteristic of the male form of *Vallisneria spiralis*, Linn., to induce a suspicion of their identity), whereas that of Griffith is a true *Isoëtes*.

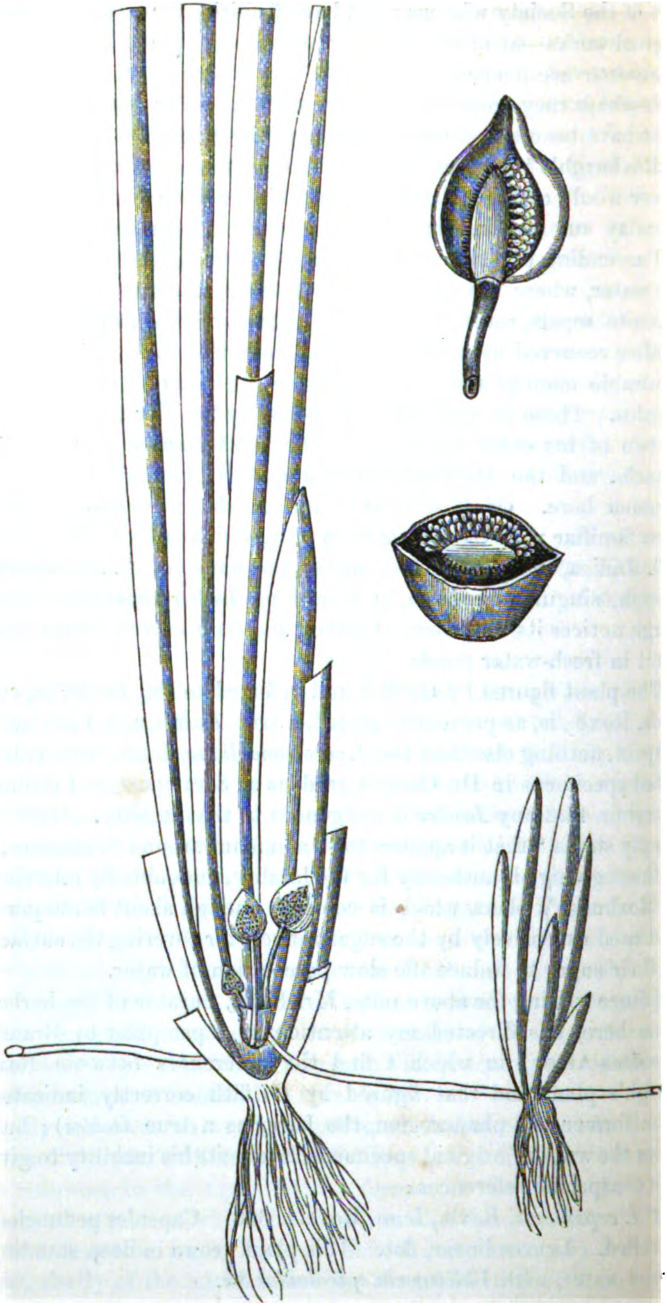
My suspicion as to the identity of *Isoëtes capsularis*, Roxb., with the male *Vallisneria spiralis*, Linn., was fully confirmed by a reference to the figure of the former in the 'Icon. Roxb.,' a reduced sketch of which I append, as also the description of the plant from the paper *loc. cit.* This I deem necessary from the singularity of the mistake, and for the satisfaction of those mem-

bers of the Society who may not have facilities for consulting the original works—all of which are scarce, though *both originator* and *transmitter* are generally known for the acuteness and accuracy with which they prosecuted their researches. The plant certainly must have been scarcer in the ponds of the Botanic Gardens here in Roxburgh's time than it now is; otherwise that excellent observer would certainly have detected his error, on seeing under a noonday sun the innumerable florets freed from their spathes and ascending like tiny air-globules till they reach the surface of the water, where the calyx quickly bursts,—the two larger and opposite sepals, reflex, forming tiny rudders, with the third and smaller recurved as a miniature sail, conjointly facilitating in an admirable manner the floret's mission to those of the emerging females. These phenomena were perfectly familiar to Roxburgh in two of his other Vallisnerias, the *Nechamandra alternifolia*, Planch., and the *Hydrilla verticillata*, Rich., both of which are common here. Of *V. spiralis*, Linn., Roxburgh seems to have been familiar with the *female* form only, which is described in his 'Fl. Indica,' vol. iii. p. 750, under the name of *V. spiraloides*, though, singularly enough, in describing *Isoëtes capsularis*, Roxburgh notices its Vallisnerioid leaves, and its occurrence with that plant in fresh-water ponds.

The plant figured by Griffith and referred to the *Isoëtes capsularis*, Roxb., is, as previously stated, a true *Isoëtes*, and, I strongly suspect, nothing else than the *I. coromandeliana*, Linn., from cultivated specimens in Dr. Carey's gardens at Serampore, as I cannot ascertain that any *Isoëtes* is indigenous to that locality. Griffith simply states "that it appears to be abundant around Serampore," without giving his authority for the locality, undoubtedly referring to Roxburgh's plant, which is common enough about Serampore, and used extensively by the sugar-refiners for covering the surface of their sugar to induce the slow percolation of water.

[Since writing the above note, Mr. Kurz, curator of the herbarium here, has directed my attention to a pamphlet by Braun, 'Isoëtes-Arten,' in which I find the differences between Roxburgh's plant and that figured by Griffith correctly indicated (the former as a phanerogam, the latter as a true *Isoëtes*); but, from the want of original specimens, he admits his inability to give the conspecific references:—

"*I. capsularis*, Roxb., Icon. Roxb. t. 696. Capsules peduncled, 1-celled. Leaves linear, flat. This plant grows in deep standing sweet water, with *Vallisneria spiraloides* &c.



"Stolons creeping, jointed; tufts of filiform roots descend from each joint, and from 4 to 12 leaves ascend; they are, like those of *Vallisneria spiraloides*, very delicate, 2–3 feet long, a quarter of an inch broad, and slightly serrated near the apex. From the alæ of the leaves arise several diaphanous cordate capsules, standing on short peduncles; they consist of one cell formed of two valves, opening from the apex; the seeds are numerous, connected to a conical receptaculum in the centre. I have not seen the male flowers."]

Synopsis of the South-African *Restiaceæ*.

By Maxwell T. Masters, M.D., F.L.S.

(With two Plates.)

[Read November 21, 1867.]

In a paper which the Society did me the honour to publish in the eighth volume of its Journal, p. 211, I entered at some length into the general conformation and minute structure of the *Restiaceæ*, or rather of the species peculiar to the Cape, and I added a condensed monograph of the South-African species of the genus *Restio*, numerically the most important group of the order. I now beg leave to lay before the Society the results of my examination of the other South-African genera and species of this family. The materials at my disposal have been derived from the same sources as those upon which my former communication was based, with this important addition—that I have had the opportunity of examining the very numerous specimens of this order collected by Burchell, and now deposited in the herbarium at Kew. The delay that has taken place, then, in the completion of this account of the South-African *Restiaceæ* is amply compensated for by the greatly increased opportunities for examination and comparison which Burchell's excellent and well-selected specimens have enabled me to make.

Under the head of each genus I propose to make a few observations on the morphology and structure of the flowers; but here some general remarks may not be out of place.

A considerable number of genera have been proposed—some by the earlier investigators of this group, such as Thunberg, Rottböll, R. Brown, and others by Palisot de Beauvois, Kunth, and especially by Nees von Esenbeck. Unfortunately, in many cases, these proposed genera have been established upon very imperfect

evidence, sometimes only upon the male flowers, which scarcely ever afford sufficient means of discrimination. At other times, considerable confusion has been created by authors describing as distinct what proves to be only the male or the female, as the case may be, of some previously described genus or species.

The proper matching of the sexes is a matter of the more difficulty from the comparative uniformity of characters presented by the males; the female plants are much more distinct one from the other.

I cannot hope to have been always right in the pairing of male and female plants, but I have at least had better opportunities for doing this correctly than my predecessors. In doubtful cases the means adopted for matching the sexes have been derived from the comparison of the sheaths, and of the minute markings on the culm; these, especially the first mentioned, often supply good evidence when that from other sources is not available. The form of the bracts and glumes is of course very important; but unluckily the shape is sometimes different in the two sexes. The same remark applies to the inflorescence. The home observer, moreover, cannot always rely for certain on the accuracy of the original collector, who may have marked such and such specimens as male and female of the same species often as a matter of conjecture only, while at other times two forms may have been sent home as belonging to the same species merely because they were found growing in proximity. Now, in this country at any rate, it comparatively rarely happens that the male and female plants of diœcious plants are found near together; it far more frequently happens that we find the male plants abundantly at one place, the females at another. It seems reasonable to suppose that the same thing may happen in other countries. In the case of the *Restiaceæ*, as in others, the perpetuation of the plant is secured by the numerous offshoots given off from the rhizome, and which to some extent obviate the necessity for seeds, which latter seem frequently not to be perfected, especially in those species with solitary flowers and indehiscent fruits.

In saying this I by no means wish to disparage the opinions of those who have had opportunities of seeing the plants growing as well as in a dried state; the frequency with which the correctness of their opinion is shown in the dried specimens would of itself prevent me from underrating their discrimination; I merely wish to state my opinion that, because a collector happens to have sent home, under the same number, male and female

plants, it does not follow that they really belong to the same species.

In addition to the positive characters I have mentioned, the student of these plants gets a kind of intuitive perception that such and such are sexual forms of the same species, though it is not always possible to make the fact obvious to others by description. But little stress, however, can be laid on this matter, as the intuitive perceptions of various observers may happen to differ widely one from the other!

It will be seen that I have considerably reduced the number of genera that have been proposed, and that I have in many cases revised and reconstructed the generic characters. Such a course was absolutely essential from the very great confusion in which the matter was involved, a confusion arising from imperfect material and opportunity, in great degree, but still more from the fact that observers have necessarily worked independently of each other. By some authors, as by Endlicher, genera have been combined or separated, as it would seem, solely from a comparison of the descriptions (often very imperfect) given by other botanists, and without reference to the actual specimens. It can easily be understood how mischievous such a practice may be. The numerous type specimens in Dr. Sonder's herbarium have been of the greatest service to me in this particular; and if I have succeeded in more perfectly circumscribing the various genera, it must be attributed mainly to the examination of the specimens so liberally placed at my disposal by Dr. Sonder. The principal points on which I have relied in the circumscription of the genera have been the inflorescence of the male and female plants, its nature, whether alike or different in the two sexes, the number of spikelets, &c. The number of the flowers in the female spikes is also a matter of great importance, as in those cases where there is only a single flower the whole structure of the flower is modified in accordance with the power that the flower now has of growing equally on all sides, and of not being compelled to accommodate itself to pressure from the bracts or other florets. The nature of the fruit, whether dehiscent or indehiscent, and the number of loculi also furnish valuable generic characters. The persistence or otherwise of the sheaths or vaginæ is also a good mark of distinction. The stamens are so uniform in their characters throughout the whole of the African species of the order, that it is but rarely I have thought it necessary to describe them fully even in the description of species.

The number of species is, naturally, from the augmentation of material, somewhat increased, while, as in the case of the genera, a great deal of reconstruction has had to be effected; but, as the synonymy has been carefully attended to, it is hoped that the inconvenience of the occasional change in nomenclature may be more than balanced by the improved circumscription of the genera and species. Considerable difficulty has been experienced, in some cases, in ascertaining to what plants the names given by Thunberg and the older observers really apply. The figures given by Thunberg and Rottböll are excellent, especially those of the latter author; but the descriptions are so meagre and vague as to be in many instances useless. It is a rare thing even for the sex of the plant to be mentioned in Thunberg's descriptions; hence I fear that some of my conjectures as to the identity of Thunberg's species may be incorrect.

It cannot but be that there are errors of judgment, as well as mistakes arising from faulty observation and imperfect evidence, in the following notes. It is much to be wished that some local observer would, with the basis now afforded him, work out the species in the living state. By so doing much additional information might be gained, and many of the shortcomings of the present descriptive account might be remedied.

The geographical distribution of *Restiaceæ* is one of their most interesting features. They appear to be distributed in nearly equal numbers along the south and south-west coasts of the Cape Colony and in the south-west corner of Australia; a small number are found in Tasmania, and a still smaller number in New Zealand. Very few are found in other districts of Australia, next to none in other parts of South Africa. One species exists in Chili, midway between the two continents, apparently more of an Australian than of an African type*. None are found in Mauritius, Madagascar, or the islands off the east coast of Africa. The study of the geographical distribution of Cape plants is much facilitated by the documents published by E. Meyer on the distribution of Drège's plants (Zwei Pflanz-geogr. Doc. 1843), and by the manuscript catalogue of Burchell now preserved at Kew. I have no intention of going into detail upon this subject; but I may remark in general terms that E. Meyer and Drège divide the Cape district

* This is another instance of the frequent "coincidence between the vegetation of Chili and that of New Holland and the Southern extremity of Africa." —*A. Murray, Geograph. Distrib. of Mammals*, p. 71. *Lambert's 'Genus Pinus,'* ed. 2. vol. ii. n. 71.

into five primary regions, which I may broadly define as follows, referring the reader for more exact details to the works just mentioned. Drège's first region, I., may be called the northern inland district, from lat. 30½° to 32° S., long. 22° to 28° E.; the second region, II., is intermediate between the northern and southern range of hills, extending from lat. 32° to 34°, and from long. 22° to 27°. The third district, III., of Drège extends along the west coast, from 29° to 35° lat., long. 17° to 19°. The fourth region, IV., intervenes between the southern hills and the sea—that is, from about 33½° S. lat. to the sea, and from 19° to 26° long. The fifth or east-coast division, V., ranges from 28° to 34° S. lat., and from 26° to 32° long. Of 191 species collected by Drège, 2 were gathered in region I., 10 in II., 190 in III., 45 in IV., and 4 or 5 in V. It will be observed that the same species occurs in more than one region. Of 114 species collected by Burchell, and of which I have memoranda; none were collected in Drège's region I., none in II., none in III., 110 in IV., and 4 in V. This account of the distribution of Burchell's specimens is only to be considered approximately correct; at any rate it is sufficiently so to show that the vast majority of the species occur between lat. 32° S. and the sea, and between long. 18° and 22.° E. In other words, the species are most abundant between the mountain-ranges on the south-west and south limits of the Cape Colony and the coast. They are frequent on the southern and western slopes of the mountains from base to summit, but are very much more rare on the opposite side.

The *Restiaceæ* thus form one of the most peculiar features of a most peculiar flora; whether that is the remnant of an ancient type of vegetation, or in what way the singularity is to be accounted for, is a problem which affords abundant scope for speculation among geologists and biologists, but upon which point I will not venture to express any opinion in this place; I would merely point out that the problem is rendered more complex from the unisexual condition of the flowers; and, as an addition to the facts that may hereafter be useful in such speculations, I may state that, though some of the genera are common to Australia and South Africa, not one of the species is found on both continents*.

Leptocarpus.

A genus established by Robert Brown, Prod. Flor. Nov. Holl.

* See Hooker, Fl. Australia, Introd. Essay, p. xlii. A. Murray, Geographical Distrib. of Mammals, *loc. cit.*

p. 250 (1810), on some Australian and South-African plants; the latter he proposed ultimately to separate as a distinct genus, on account of their spicate, not fasciculate inflorescence. He does not appear, however, to have done more than make the proposal; but Kunth, En. iii. p. 442, has grouped the same plants under his genus *Staberoha*, here considered as a section of *Thamnochortus*. Thus restricted, Brown's *Leptocarpus* would comprise merely Australian species with fasciculate inflorescence, one-celled indehiscent fruits, &c.; but Hooker, Handbook of the New-Zealand Flora, p. 294, as well as in the Flora of Tasmania, has included within the genus species with a spicate, not tufted inflorescence, rightly judging that the character of the inflorescence, taken by itself, was not sufficient to divide the genus into two. Taking, then, the genus as Hooker defines it, it becomes necessary to include in it Palisot de Beauvois and Desvaux's genus *Calopsis*, with spicate inflorescence, and whose floral structure is entirely that of the original *Leptocarpus*. The species mentioned by Brown are so different from *Leptocarpus* or *Calopsis* that they must remain under *Staberoha* (§ of *Thamnochortus*), where Kunth, apparently in ignorance of Brown's statement, placed them. The species of *Leptocarpus* have the habit and appearance of species of *Restio*, from which, as far as the male flowers are concerned, it is not possible to distinguish them; the female flowers, however, are readily distinguished by their one-celled ovary and indehiscent fruit. From *Thamnochortus* the present genus differs in the perianth of the female flower, and in the angular fruit.

THAMNOCHORTUS.

Originally proposed by Bergius (Flora Capensis, p. 353, t. 5. f. 8), in 1767, and adopted by R. Brown (Prod. p. 244), this genus comprises a few species, some of which have been referred to the genus *Restio*. *Thamnochortus*, however, is a well-defined genus, differing from its allies in its persistent sheaths, many-flowered spikelets, deeply winged outer glumes (especially in the female flower), and indehiscent, one-celled, one-seeded fruit.

Kunth's genus *Staberoha** only differs from the typical form in the presence of two or three stigmas, and hence bears a relation to *Thamnochortus* similar to that which the three-styled Restios do the rest of that genus. But though there are two,

* See remarks on *Leptocarpus*.

and sometimes three, stigmas in the section *Staberoha*, the fruit is unilocular as in the other species of *Thamnochortus*. It is in this genus that some of the handsomest plants of the whole order are to be found. Whether the deeply winged glumes serve any purpose in the dissemination of these plants, or no, I know not; still it is curious to remark that the wing is much larger in the female than in the male flowers: in the latter it is rudimentary merely, while in the former it is often so wide as to project beyond the bracts, and to overlap or become overlapped by the wings of the adjoining florets.

CANNOMOIS.

Established by Palisot de Beauvois, in 1828, upon a female plant corresponding, I believe, to the male plant called by Rottboell *Restio virgatus*.

The male plants have the inflorescence of *Thamnochortus* or *Leptocarpus*; but the female flowers are very different. In them the perianth is nearly regular, but very small, as in *Willdenovia*, which genus it resembles in the fruit, but differs in the absence of a thickened stipes, in the presence of several rudimentary female flowers, in the spikelet, and in other points. Nees's genus, *Mesanthus*, is in no wise distinguishable from *Cannomois*. *Cucullifera* of the same author only differs in the terminal bract of the spikelet, which is more convolute than usual.

Owing to the detachment of the vascular cord (supplying the seed) from the side of the fruit, the seed in this genus often has the appearance of being suspended from the end of a free funiculus.

ELEGIA.

Founded by Linnæus in 1771 (in his Mantissa, p. 162, Gen. n. 1331), on a plant which he named *E. juncea*, which I believe to be the same as was figured, a year or two afterwards, by Rottböll (Descr. et Ic. p. 8. n. 9, t. 3. f. 4, 1772–3), as *Restio thyrsifer*.

Rottböll's genus *Chondropetalum*, published at the same time, must also cede to Linnæus's *Elegia*, on the ground of the priority.

Kunth, following Thunberg, Endlicher, and Nees von Esenbeck, admits into this genus plants with an indehiscent, triangular, one-celled fruit, and others with a trilocular dehiscent capsule. But as the original species, just alluded to, has a unilocular indehiscent fruit, I have thought it better to retain that as the cha-

racter of *Elegia*, and to place in Kunth's genus *Dovea* the species with a three-celled dehiscent capsule. By so doing I have, I believe, strengthened the characters of both. As now constituted, the essential characters of *Elegia* reside in the deciduous sheaths, the loosely paniculated male inflorescence, and the triangular or compressed indehiscent fruit. (See *E.*? *squamosa*, *E.*? *grandis*, and *E.*? *Neesii* for further remarks on this genus.)

Dovea.

One of the genera established by Kunth (in his 'Enumeratio,' vol. iii. p. 457, 1841), upon female plants only. The male plants which, I consider, belong to this genus are described under the heads of their respective species; they do not differ in any material points from the male plants of *Elegia*. On the other hand, the female flowers have a trilocular dehiscent fruit; so that *Dovea* stands intermediate between *Restio* and *Elegia*, having the habit and inflorescence of the latter, as far as regards the male plant, while its fruit is precisely like that of the second or tricarpellary section of the genus *Restio*.

Askidiosperma.

A little-known genus, established by Steudel, on a female plant of Drège's, n. 2510. It has a many-flowered female spikelet, trilocular dehiscent fruit, and deciduous sheaths.

Hypodiscus.

In Lindley's 'Natural System of Botany,' ed. 2, 1836, p. 450, Nees von Esenbeck proposed the adoption and gave the characters of this genus, and also of one called *Leucoplœus* *. Prior to this, in the Linnæa, v. p. 665, he had formed a genus which he called *Lepidanthus*. Later (1841) Kunth, En. iii. p. 448, described a genus under the name of *Boeckhia*. Endlicher (Gen. Plantarum, p. 121) reduced *Hypodiscus* and *Leucoplœus* to sections of *Willdenovia*, probably without having examined the plants.

Lepidanthus was described from the male plants only; and the anthers were incorrectly described as bilocular; it has therefore been considered to be, as its author said, "genus vix notum, summopere dubium."

The examination of numerous specimens of these plants, especially of the authentic types of Nees, in Dr. Sonder's herbarium,

* Or, more properly, *Leucoplocus*, which is the version in Nees's manuscript.

has led me to combine all the above-named genera into one, my warranty for so doing being derived not only from comparison of the various plants, but also from the statements of Nees von Esenbeck, in Dr. Sonder's herbarium, wherein are contained notes, in the handwriting of the eminent botanist just mentioned, to the effect that the genus named by him *Hypodiscus* is the same as that called by Kunth *Boeckhia.* The genus, as now constituted, is not distinguishable from *Restio* or *Leptocarpus*, as far as the male plants are concerned; but the female flowers are wholly different, and are more like those of *Willdenovia*; indeed one species, *H. aristatus*, has precisely the same form of female flower as the species of *Willdenovia*: that is to say, the perianth is supported on a fleshy stalk or stipes, with the top of which the base of the glumes is continuous; the ovary, too, is supported on a short slender stalk. On the other hand, the male flowers are in compact spikes, and have an unequally 6-glumed perianth, very unlike that of *Willdenovia.* In the remaining species of this genus the florets are either sessile or, if stalked, the stalk is very short and slender; the perianth is six-glumed, the glumes being nearly equal in size and form, and persistent around the base of the fruit. The ovary is stalked; and sometimes, especially in *H. albo-aristatus* and *H. synchroolepis*, the gynophore expands into a shallow, fleshy, cup-like, lobed disk, in which the base of the ovary is placed, and with which it is occasionally coherent; so that the disk in question is sometimes completely hypogynous, at other times perigynous. The surface of the ovary, especially its upper portion, is generally studded with tubercles, which increase in size and consistence as the fruit ripens. The base of the style is also often dilated into a fleshy mass surmounting the ovary, and continuous with the tubercles just mentioned; so that in some of the species the ovary or fruit appears to have an hypogynous or perigynous disk below, and an epigynous one above. Without an examination of fresh specimens, in various stages of development, it would be presumptuous to make any very positive assertions as to the nature of these disks; but, so far as I have been enabled to ascertain their nature, I believe the hypogynous and perigynous disks to be cellular expansions from the stalk supporting the ovary. In the female flowers of *H. aristatus*, the flower itself is supported by a fleshy stipes. The tubercles on the upper portion of the ovary, and the dilated base of the style, are also purely cellular excrescences. What their purport may be I know not.

Hypolæna.

As originally constituted by Brown (Prodr. p. 251) this genus comprised two Australian species, to which Nees (in Linnæa, v. p. 663) added a third from the Cape. Amongst its allies this genus is distinguished by the male plants, which are like those of *Restio*, while in the solitary spicate female flowers it is more nearly allied to *Hypodiscus* and *Willdenovia*, from both of which it is separated by its sessile fruit, destitute of disk-like appendages either above or below. From the last-named genus it differs especially in the inflorescence.

Under this head I have placed a few male plants, for the most part collected by Burchell, and which I have not hitherto been able to match. In most of the species the male spikelets are placed with their edges directed towards the rachis or main axis, the florets themselves, in that case, having their backs turned against the axis; but, in a few cases the spikelets are placed back to the rachis, as in *Triticum*, the florets then being edgewise. When this last arrangement exists, it usually happens that the outermost lateral glume is larger than the rest, having more room to expand. Where the spikelets are placed with their edges to the axis, and the flowers have their backs placed against or parallel with, it, the form of the perianth, and of the outer glumes especially, seems to be modified according to the degree of pressure exerted on them, or the amount of space left for their development. If the bracts are tightly packed, and the outer glumes are large, as in *H. impolita*, then the whole flower is concave on the dorsal aspect, so as to fit on to the axis, and the two outer lateral glumes are by this curvature of the flower thrown back against the rachis, the anterior glume of the outer series (which is smaller) being thrust forwards. In other instances, where the perianth is relatively smaller, there is not so much impediment offered to its growth, and the glumes in that case are nearly equal in size, and the flower is not concave posteriorly.

Willdenovia.

Taken as originally proposed by Thunberg (Act. Holm. 1790, p. 28) this genus is natural and well defined. Later writers, such as Endlicher and Nees von Esenbeck, impaired its character by including within it plants that have only a slight affinity to it. Kunth, however (En. iii. p. 453), takes the genus in the Thunbergian sense, though his description is not sufficiently accurate.

The main characteristics of the genus reside in the male inflorescence, which is a loose cymose panicle—the bracts and the glumes being comparatively very long and narrow, and flat and membranous in texture. The female inflorescence, on the other hand, is a compact spike, with numerous closely imbricated bracts, of leathery texture, all of which are sterile, except the terminal one, or have only the rudiments of flowers in their axil. The perianth consists of six small, almost rudimentary, membranous pieces, which sometimes increase in size as the fruit ripens, and which in all cases are confluent at the base, with a thickened, fleshy, six-lobed disk beneath the flower and from which they sometimes separate in course of time, leaving only the six-lobed fleshy portion, just alluded to, around the base of the fruit. This disk appears to me to be nothing but the tubular and fleshy base of the perianth, encircling, and, to some extent, adhering to, the stalk supporting the ovary. If this view be correct, the membranous glumes would constitute the limb of the perianth. The study of the development of the female flower can alone settle this point satisfactorily; but it seems to me to be borne out by some young flowers that I have examined, in which, while the thick tubular disk is apparent, the membranous lobes on its edge are less distinctly visible, while in other flowers a gradual increase in the size of these lobes is perceptible. The ovary or unripe fruit is oblong, and terminates in a horny subglobose extremity, from which the two styles proceed. The lower portion of the ovary in this stage is spongy; and the hardening seems to proceed from above downwards, so that ultimately an oblong, obtuse, cylindrical, indehiscent fruit is produced, like that of *Cannamois*, except that the latter is somewhat flattened, not cylindrical.

The seed has a thin loose testa surrounding the horny albumen.

The spongy disk below the female flower, coupled with the loosely panicled male inflorescence, serves to distinguish this genus from the other *Restiaceæ*. Its nearest ally is *Hypodiscus*; but this differs in its compact male inflorescence, as also does *Hypolæna*, in which latter, moreover, there is no thickened disk below the flower. *Ceratocaryum* resembles *Willdenovia*, as regards the inflorescence of the male plants; on the other hand, the female flowers are destitute of a disk.

Ceratocaryum.

A genus established in 1836, by Nees von Esenbeck, in the

second edition of Lindley's 'Natural System of Botany,' p. 451, upon a single species, to which I have added a second and, apparently, a very distinct form. With much of the structure of *Willdenovia*, as regards the male inflorescence, it differs in the absence of a thickened disk below the female flower: the styles, moreover, are thick and almost woody, and are persistent or nearly so. These circumstances, combined with the difference in habit, induce me to consider this a very distinct genus.

Anthochortus.

A genus established by Nees, upon some male plants, the types of which exist in Dr. Sonder's herbarium. As I am able to add nothing to Nees's account of this genus, I leave it as I found it, and quote the words of Endlicher with reference to the plants, "Herbæ capenses vix notæ," Gen. Plant. 121.

The male plant in Dr. Sonder's herbarium has a general resemblance to the Australian *Calorophus*.

Craspedolepis.

A genus founded by Steudel, and wholly unknown to me.

Restio.

Since the publication of my former paper, in which the South-African species of this genus were described, the examination of more extensive materials, especially the study of Burchell's specimens, has enabled me to make a few additions and corrections, which are appended to the description of the other genera of the order.

Clavis analytica generum Restiacearum in Africâ australi vigentium.

Fructus capsularis dehiscens.
  Vaginæ culmeæ persistentes .... RESTIO.
  Vaginæ culmeæ deciduæ, caps. 3-loc....... DOVEA.
  „ „ caps. 2-loc. ...... ASKIDIOSPERMA.
Fructus indehiscens.
  Inflorescentia ♂ et ♀ spicata.
    Flores feminei 2 vel plures.
      Fructus trigonus .... LEPTOCARPUS.
      Fructus compressus.
        Glumæ externæ flor. fem. alatæ. THAMNOCHORTUS.

Glumæ externæ flor. fem. alis destitutæ .... CANNOMOIS.

Flores feminei solitarii.

Ovarium stipitatum, plerumque disco munitum .... HYPODISCUS.

Ovarium sessile. Discus hypogynus v. perigynus nullus .... HYPOLÆNA.

Inflorescentia ♂ et ♀ paniculata v. fasciculata .... ELEGIA.

Inflorescentia ♂ paniculata, infl. ♀ spicata.

Fructus stipiti carnoso impositus......... WILLDENOVIA.

Fructus stipite destitutus................. CERATOCARYUM.

Genera mihi non satis nota.

Anthochortus, *Nees ab Esenb.*
Askidiosperma, *Steudel.*
Craspedolepis, *Steudel.*

Genera excludenda vel pro sectionibus tantum habenda.

Bœckhia, *Kunth.* = Hypodiscus.
Nematanthus, *N. ab E.* = Willdenovia.
Leucoplocus, *N. ab E.* = Hypodiscus.
Mesanthus, *N. ab E.* = Cannomois.
Cucullifera, *N. ab E.* = Cannomois.
Lepidanthus, *N. ab E.* = Hypodiscus.
Staberoha, *Knth.* = Thamnochortus.
Rhodocoma, *N. ab E.* = Restio.
Ischyrolepis, *Steudel* = Restio.

LEPTOCARPUS, *Brown, Prod. Fl. Nov. Holl.* (1810), p. 250, pro parte. *Kunth, Enum.* iii. p. 480. *Hook. fil. Handb. New Zeal. Flora,* i. p. 295; *Flor. Tasman.* ii. p. 72.

Calopsis, *Desvaux et Palisot de Beauvois, Ann. Sc. Nat.* 1828, p. 44. *Kunth, Enum.* iii. p. 421. *Steud. Synops.* ii. p. 257.

1. L. PANICULATUS.—Restio paniculatus, *Rottb. Desc. et Ic.* p. 4, t. 2. f. 3.—Restio fruticosus, *Thunb. Diss.* 16. n. 14; *Kunth, En.* iii. p. 413.—Restio ramiflorus, *Nees ab Esenbeck, Linnæa,* v. p. 644.—Calopsis paniculata, *Desv. Ann. Sc. Nat.* 1828, xiii. p. 44, t. 3. f. 2; *Kunth, op. cit.* iii. p. 421.

Hab. Pr. B. Sp., ex. sp. s. ♂, *Burchell,* nn. 5813! 5732; *J. R. et G. Foster*!; Table Mountain, *Ecklon,* 849!; Grahams Town, *Eckl.* 922!; Uitenhage, *Eckl.* 540!; in planitie Capensi, *Eckl.* 568!; *Drège,* 167 B!; Zwarts Koprivier (Feb.), *Zeyher,* 4346!; *ejusdem,* 922!

♀, Albany, *Williamson*!, *Kastalsky*!; *Drège*, 5!, 167 B!; *Eckl.*, 568!, 166!; *Dr. Thom*, sine numero!

♂ et ♀, *Burchell*, 405!

A widely distributed and variable species. Two special forms can in general be readily recognized, the one with elliptic somewhat obtuse bracts scarcely exceeding the flowers, the other with acute or acuminate bracts equal to, or generally longer than, the flowers; this latter is perhaps the *Restio fruticosus* of Thunberg—a point which, in the absence of Thunberg's specimens, I am not able to determine for certain. The two forms, however, are connected by so many intermediate ones, that it seems undesirable to make two species.

Nees's *Restio ramiflorus*, as I find from a specimen so named by Nees himself, is nothing but a form of this species in which the flowers are replaced by minute tufts of scales. Kunth also refers to this plant (which in the specimens he examined had male flowers), and considered it merely a form of *Calopsis paniculata*.

The male plant of this species is preserved in Linnæus's herbarium under the name of "*Restio paniculatus*."

2. L. Burchellii, sp. n. Culmis ramosis dimorphis, sterilibus brevioribus; vaginis arctis, subulato-mucronatis vel in ramis fertilibus aristatis; spiculis masculis subpollicaribus, oblongis, in spicam terminalem dispositis, bracteis 5-fariam imbricatis, demum laxe patentibus oblongo-lanceolatis, flores superantibus; glumis omnibus glabris; spiculis femineis conformibus, plurifloris; glumis oblongis obtusis, internis 3, quam externis parum longioribus; ovario oblongo trigono, stigmatibus 3 villosis superato.

Hab. Pr. B. Sp., ex. sp. s. ♂ et ♀, *Burchell*, 7185!; ♂, *Burchell*, 6101!, 7146!

Culmus, ut videtur, bi- tripedalis, teres, erectus, crassitie pennæ gallinaceæ, dichotome ramosus; *rami fertiles* erecti, elongati, teretes, olivacei, albo tuberculati; *rami steriles* conformes, breviores, tenuiores, arcuati. *Vaginæ culmeæ* laxiuscule convolutæ, subpollicares, ellipticæ, coriaceæ, striatæ, superne (ad margines) tenuiores, sub apice obtuso subulato-mumucronatæ. *Vaginæ ramorum fertilium* conformes, minores, mucronibus gracilioribus magis minusve tortis. *Vaginæ ramulorum sterilium* parvæ, 2–3 lin. latæ, valide subulato- vel foliaceo-mucronatæ. *Spiculæ masculæ* 00, in paniculam simplicem terminalem approximatæ, singulæ pollicares, oblongæ, erectæ, pluriflоræ, basi spatha bracteiformi aristata obtectæ. *Bracteæ* arcte 5-fariam dispositæ, demum laxiuscule patentes, oblongo-lanceolatæ, coriaceæ, fuscæ, sub apice tenuiore mucronulatæ, flores oblongos superantes. *Glumæ externæ* oblongæ, rigidiusculæ, ferrugineæ, purpureo maculatæ; *laterales* naviculari-conduplicatæ, villoso-carinatæ; *intermedia* planiuscula; *glumæ internæ*

conformes, minores, hyalinæ, planiusculæ. *Antheræ* lineari-oblongæ, apiculatæ, flavidæ, dorso ferrugineæ. *Spiculæ femineæ* 4–5, in paniculam terminalem dispositæ, singulæ plurifloræ, oblongo-lanceolatæ, erectæ, 4–5 lin. longæ, spatha vaginiformi aristata suffultæ. *Bracteæ* ut in mare. *Glumæ externæ* rigidiusculæ, oblongo-lanceolatæ, ferrugineæ, maculatæ; *laterales* naviculari-conduplicatæ, carinatæ, carina glabra. *Glumæ internæ* conformes, planiusculæ vel superne (ad margines) parum involutæ, externis paullo longiores. *Ovarium* trigonum, oblongum, purpureum, 1-loculare, stigmatibus 3 lineari-ligulatis superatum.

3. L. INCURVATUS.—Restio incurvatus, *Thunb. Fl. Cap.* i. 88.—Restio vimineus, *Rottb. Descr. et Ic.* p. 4, t. 2. f. 1, teste Neesio.—Calopsis incurvata, *Kunth, Enum.* iii. p. 427; *Steud. Synops.* ii. p. 258, pl. masc. tantum.—Calopsis festucacea, *Kunth, Enum.* iii. p. 425; *Steud. Syn.* ii. 258, quoad femineam.

Hab. Pr. B. Sp. Ex. sp. s. ♂, False Bay, *Robertson*!; Tafelberg, *Eckl. Un. Itin.* 847!; Groenekloof, *Eckl.* n. 349!; *Eckl. et Zeyh.* i. 12!; *Eckl.* 83!; *Dr. Pappe*, 99!; *Drège*, 63A!, 63B!

♀, *Burchell*, 832!; *Eckl.* 934!; Pampoosenkraal, *Eckl.*!; *Drège*, n. 2481!

♂ et ♀, *Eckl. et Zeyh.* i. 11!

This species varies considerably in the size of its parts, in the erect or flexuous stems, and other minor points. In the younger female flowers, the inner lateral glumes are conduplicate, like the outer ones, and are somewhat mucronate.

4. L. OXYLEPIS.—Calopsis oxylepis, *Kunth, Enum.* iii. p. 427; *Steud. Synops.* ii. p. 258.

Hab. Pr. B. Sp., ex. sp. s. ♂, *Drège*, n. 2501, pro parte!, 2500, pro parte! ♀, *Drège*, nn. 38!, 39!; *Eckl. et Zeyh.* i. 12!

Stirpis masculi a cl. Kunthio indescripti notas adjicio.

Culmi erecti, teretes (1–2-pedales), crassitie pennæ corvinæ, versus basin dichotome ramosi, ramique erecti, elongati, glabri, vel velutino tomentosi. *Vaginæ culmeæ* (½–1 poll.) laxæ, erectæ vel vix apice recurvatæ, ellipticæ, coriaceæ, pallide ferrugineæ, sub apice acutiusculo pallidiore mucronato-aristulatæ. *Spiculæ* masculæ in apice ramulorum distiche spicatimque approximatæ, nunc congestæ, singulæ cylindraceo-lanceolatæ, erectæ, 4–5 lin. longæ, basi spathis vaginiformibus ipsis brevioribus vel eas subæquantibus, suffultis, rachin communem complanatam villosulam latere uno respicientibus. *Bracteæ* undique arcte imbricatæ, ellipticæ, acutæ, cymbiformes, coriaceæ, ferrugineæ, nitentes, sub apice brevissime mucronatæ, mucronibus spadiceis, flores oblongos parum superantes. *Glumæ externæ* laterales, oblongo-acutæ, naviculari-conduplicatæ, villoso carinatæ, *intermedia* conformis, planiuscula. *Glumæ internæ* 3, minores, tenuiores, obtusiusculæ. *Antheræ* ovatæ, acutæ, apiculatæ, dorso pallide castaneæ.

Differs from *L. peronatus* in the smaller, less recurved sheaths, and in the spathes, which scarcely equal the spikelets; glabrous and downy stems occur on the same specimen, the latter thus resembling the *L. peronatus*, var. *hirtellus*.

5. L. PERONATUS. Culmis teretibus, dichotome ramosis, ramis simplicibus erecto-patentibus; vaginis pollicaribus et ultra, recurvato-patulis, coriaceo-papyraceis, sub apice obtuso mucronato-subaristatis; spiculis masculis cylindraceis, spathas vaginiformes vix superantibus, in paniculam cymosam parce ramosam dispositis; bracteis arcte imbricatis, oblongo-acutis, mucronulatis; cymis femineis linearibus, parce ramosis, ramis brevibus erectis tristachyis, basi spatha vaginiformi spiculas cylindraceas velante munitis; bracteis oblongis, sub apice obtuso mucronato-aristatis.

Calopsis peronata, *Kunth, Enum.* iii. 426, *Steud. Synops.* ii. 258, quoad femineam.

Me judice planta mascula Dregeana ("1623"?) a cl. Kunthio speciei supra descriptæ relata ad *Restionem ochreatum*, Kunth, pertinet.

Var. *hirtellus.* Culmis ramisque velutino tomentosis.

Calopsis hirtella, *Kunth, Enum.* iii. p. 426; *Steud. Syn.* ii. p. 258.

Hab. Pr. B. Sp., ex. sp. s. ♂, *Drège,* 38!, 2500 pro parte!, 2501 pro parte!; *Harvey*, 364!

♀, *Drège,* 2499 pro parte!

Var. hirtellus, ♂, *Drège,* 2500 pro parte!. ♀, *Drège,* 2499 pro parte!

Culmi cæspitosi, erecti, 18–24-pollicares, crass. pennæ corvinæ, teretes, infra medium dichotome ramosi, hique erecti, patentes, elongati, olivacei, punctulati, glabri vel villosuli. *Vaginæ culmeæ* laxæ, erectæ vel sæpius recurvatæ, ellipticæ, coriaceo-papyraceæ, purpureo maculatæ, sub apice obtuso pallidiore mucronato-aristatæ. *Spiculæ masculæ* 00, in cymas lineares, distichas, parce ramosas dispositæ, *rami spiculigeri* erecti, tristachyi, nunc subcongesti, basi spatha vaginiformi, spiculas imprimis includente, suffulti. *Spiculæ* singulæ cylindraceo-lanceolatæ, interdum leviter arcuatæ, 3–4 lin. longæ, vix 1 lin. latæ. *Bracteæ* arcte imbricatæ, oblongæ vel ellipticæ, coriaceæ, pallide ferrugineæ, nitidæ, sub apice obtusiusculo tenui pallidiore, vix mucronatæ, flores compressos oblongos obtusos superantes. *Glumæ* oblongæ; *externæ* laterales naviculari-conduplicatæ, villoso-carinatæ, ferrugineæ, rigidiusculæ; glumæ aliæ vix breviores, planiusculæ oblongæ, obtusæ membranaceæ; *internæ* 3 imo basi connatæ. *Filamenta* albida. *Antheræ* oblongæ, obtusæ, apiculatæ, dorso pallide ferrugineæ, antice flavidæ. *Spiculæ femineæ* 00, in cymas erectas lineares distichas pluriramosas dispositæ; *rami* erecti, tristachyi, basi spatha vaginæformi spiculas obtegente suffulti. *Spiculæ* cylindraceo-lanceolatæ, erectæ, 6 lin. longæ, 1–1½ lin. latæ, plurifloræ. *Bracteæ* arcte imbricatæ, ellipticæ, coriaceæ, ferrugineæ, nitidæ, sub apice obtusiusculo mucronatæ mucrone erecto validiusculo, flores superantes. *Flores* infimi

abortivi; cæteri perfecti, oblongi. *Glumæ externæ laterales* rigidiusculæ, oblongæ, obtusæ, pallide ferrugineæ, naviculari-conduplicatæ, villoso carinatæ; *gluma intermedia* oblonga, obtusa, membranacea; *glumæ internæ* 3, oblongæ, obtusæ, membranaceæ, externis dimidio breviores, *postica* planiuscula, *laterales* ad margines superne parum involutæ. *Ovarium* oblongum, obtusum, subtrigonum, disco epigyno, calloso, flavido superatum. *Stigmata* 3, linearia, elongata, villosa, demum exserta.

The arrangement here proposed is, I believe, more in accordance with truth than that published by Kunth; for while the plant that he referred to the male of this species, "1623 ?, Drège," is clearly the male of *Restio ochreatus*, Kunth, the plant named by the same author *Calopsis hirtella* only differs from *L. peronatus* ♀ (so far as the culm and sheaths go) in the one character that the surface in the former is covered with a velvety pubescence; but as this is inconstant, depending apparently on the age of the plant, and is also found on some of the female plants of *L. peronatus*, we must either make two species, one glabrous, one velvety, or consider them varieties one of the other: I prefer the latter course, as there are no other appreciable differences except in the pubescence, while both forms seem to have been met with at the same time and place, and to have been sent home under the same numbers. Kunth's *C. oxylepis* resembles the above species closely, but may be known by the shorter and less-recurved sheaths.

6. L. NEGLECTUS.—Calopsis neglecta, *Hochst. Flora*, 1845, p. 358; *Steud. Syn.* ii. p. 258.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Drège*, n. 68!
♂, *Burchell*, 8016!, pro parte.

7. L. MODESTUS.—Thamnochortus modestus, *Kunth, Enum.* iii. p. 434, *quoad plant. masc.*—Restio paleaceus, *N. ab. E. MS. in herb. Sonder. pro parte.*

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Drège*, 138 b!; Albany, *Williamson*! *Eckl. et Zeyh.* 82!; Graham's Town, *Ecklon, sine numero*!; *Burchell*, 8016!
♀, *Drège*, 7!

Plantæ femineæ, adhuc indescriptæ, *culmus vaginæque* ut in mare. *Spiculæ* 00, sing. 1-floræ, 2–3 lin. longæ, oblongæ, acutæ, erectæ, basi *spatha* aperta, vaginiformi, aristata suffultæ et in paniculam cymosam terminalem dispositæ. *Bracteæ* arcte imbricatæ, coriaceæ, ferrugineæ, sub apice membranaceo mucronatæ, omnes, una excepta, steriles. *Flos* solitarius, terminalis, stipitulatus, oblongus, bractea stipante vix brevior. *Glumæ* subæquales, rigidiusculæ, ferrugineæ, oblongo-acutæ, subcymbiformes; staminodia liguliformia, 3? vel nulla. *Fructus* imma-

turus 3-gonus, coriaceus, abortu 1-locularis, ferrugineus, ut videtur indehiscens, *stigmatibus* 3 ferrugineo villosis superatus.

There is so close a correspondence between the male and female plants in outward appearance that I have no hesitation in uniting them, though I have only seen a single specimen of the female. The solitary terminal flower is unusual in this genus.

THAMNOCHORTUS, *Bergius*, *Fl. Cap.* p. 353; *R. Brown*, *Prod.* p. 244; *Kunth*, *Enum.* iii. p. 428.
Restionis species, *Thunb.*, *Nees aliorumque*.
Staberoha, *Kunth*, *Enum.* iii. p. 442.

* *Stylus* 1.

1. T. PLATYPTERIS, *Kunth*, *Enum.* iii. p. 429; *Steud. Syn.* ii. p. 258. *Hab.* Pr. B. Sp. Ex. sp. s. ♂, *Drège*, 2502 b!; *Ecklon*, 76! ♀, *Drège*, 139!, 2512!

Plantæ masculæ, cl. Kunthio ignotæ, *culmus vaginæque* ut in feminea. *Panicula* mascula terminalis, erecta vel subnutans, pluristachya, spatha aperta vaginiformi erecta suffulta. *Pedicelli* laxi, complanati, ad margines villosuli. *Spathulæ* lanceolatæ, acutatæ, coriaceæ, ferrugineæ, dorso medio nervo prominente notatæ. *Spiculæ* pluriflore, oblongæ, 4–5 lineas longæ. *Bracteæ* imprimis arcte imbricatæ, demum apice parum patentes, coriaceæ, ferrugineæ, lanceolatæ, nervo medio prominente et apice in mucronem terminalem producto, donatæ. *Flores* obovati v. oblongi, compressi, arcuati, bracteis paullo breviores. *Glumæ* oblongæ, ferrugineæ, membranaceæ, *externæ* breviores, *laterales* naviculari-conduplicatæ, anguste alatæ, apiculatæ, glabræ; *internæ* oblongæ, planiusculæ, externis paullo longiores. *Stamina* inclusa. *Antheræ* apiculatæ.

This species is allied to *Elegia* in the fact that in the male flowers the inner segments of the perianth are shorter than the outer. Ecklon's specimens have the culms furrowed longitudinally in drying; and its pedicels are sometimes glabrous.

2. T. ELONGATUS. Culmis teretibus, vaginis arctis subbipollicaribus, mucronatis, superne demum laceratis; spiculis masculis 00, cymoso-paniculatis, singulis oblongo-cylindraceis, rectis vel leviter curvatis; bracteis arcte imbricatis, oblongis, acutis; glumis oblongis, apiculatis, externis anguste alatis; antheris apiculatis; spiculis femineis, 6–12, in spicam linearem cymosam dispositis, singulis subglobosis; bracteis apice demum patentibus, ovato-lanceolatis, flores 2–3-plo superantibus; glumis oblongis, externis lateralibus profunde alatis.—Restio elongatus, *Thunb. in Hoffm. Phytogr. Blätt.* p. 7.—R. simplex, *Forst.*?, *Steud. in Flora*, 1829, i. p. 134.—R. nutans, *Thunb. Fl. Cap.* i. p. 84,

fide *Nees*.—Thamnochortus dichotomus, *Kunth*, *Enum*. iii. p. 433, pro parte.—Restio paleaceus, *Nees in herb*., pro parte.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Masson* !, *Burchell*, 6169 !, 6284 !; Table Bay, *Robertson* !; *Eckl*. 23 !, *Eckl*. 77 !; *Drège*, 129 !, 135 ! (spec. juvenilia ?); *Dr. Thom*, 900 !; ?*C. Wright*, 489 !

♀, *Eckl. et Zeyh*. 1. 11 !; Tigerberg, *Zeyher*, 1093 !; *Ecklon*, 84 !, 85 !, 838 !; *Dr. Thom, in herb. Kew*. 542 !

♂ et ♀, *Drège*, 129 !

Culmi fertiles cæspitosi, erecti, 2–4-pedales, teretes, simplices, crassitie pennæ gallinaceæ, straminei, obsolete impresso punctulati, basi vaginis spadiceis approximatis dense vestiti, superne remote vaginati. *Culmi steriles* spithamæi et ultra, infra medium dichotome ramosi, *ramis* semiteretibus, iterum iterumque divaricato ramosissimis, ramulis ultimis crassiusculis foliosis. *Vaginæ culmorum fertilium* arcte convolutæ, ellipticæ, coriaceæ, fuscæ, nervoso-striatæ, sub apice membranaceo mucronatæ, nonnunquam laceræ, $1\frac{1}{2}$–2-pollicares. *Vaginæ culmorum sterilium* minores, superne lacerato-membranaceæ, mucronulatæ. *Vaginæ ramulorum* in folium subulatum curvatum productæ. *Spiculæ masculæ* numerosæ, in paniculam terminalem cymosam, parce diffusam vaginisque apertis brevibus interstinctam dispositæ, singulæ oblongo-cylindraceæ, rectæ vel leviter arcuatæ, 3–5 lin. longæ. *Bracteæ* arcte imbricatæ, oblongæ, acutæ, mucronulatæ, concavæ, coriaceæ, ferrugineæ, marginibus superne parum membranaceis, flores oblongos vix superantes. *Glumæ* oblongæ, membranaceæ, ferrugineæ, *laterales externæ* naviculari-conduplicatæ, apiculatæ, angustissime carinatæ, *antica* planiuscula; *internæ* 3, conformes, minores, tenuiores. *Antheræ* inclusæ, apiculatæ.—Plantæ femineæ *culmi vaginæque* ut in mare. *Spiculæ* 5–12, subglobosæ, sing. 3–5 lin. longæ, plurifloræ, in cymam linearem, disticham, erectam, terminalem dispositæ. *Bracteæ* undique imbricatæ, superne parum patentes, ovato-lanceolatæ, coriaceæ, ferrugineæ, ad margines tenuiores, flores compressos orbiculares 2–3-plo superantes. *Glumæ* membranaceæ, ferrugineæ, *externæ laterales* oblongæ, obtusæ, naviculari-conduplicatæ, profunde alato-carinatæ, *gluma intermedia* antica paullo brevior, planiuscula, ovato-oblonga, dorso nervo medio notata; *glumæ internæ* conformes, tenuiores, *postica* paullo latior, ad margines parum involuta. *Fructus* subcompressus, ovatus, coriaceus, fuscus, glaber, unilocularis, indehiscens, *stigmate* diu persistente, lineari, exserto coronatus.

This species differs from *T. dichotomus* in its less acutely pointed and more oblong bracts, as well as in the more rounded form of the female spikes.

3. T. ARGENTEUS, *Kunth*, *Enum*. iii. p. 432; *Steud*. *Syn*. ii. p. 259.—Restio argenteus, *Thunb*. *Diss*. p. 14. 11.

Variat bracteis pallide castaneis.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Burchell*, 6978 !; *Drège*, 132 b !

Q 2

♀, *Masson*!, *Drège*, 132!; Uitenhage, *Zeyher*, 291!

♂ et ♀, locis rupestribus in montibus prope Appelskraal (Sept.), *Zeyher*, 4349!

Plantæ femineæ, hucusque indescriptæ, *culmus, vaginæ bracteæque* omnino ut in mare. *Spiculæ* masculinis conformes sed magnitudine majores. *Flores* orbiculares, complanati, arcuati, stipitulati. *Glumæ externæ laterales* obtusæ, apiculatæ, profunde membranaceo alatæ, glabræ, ferrugineæ, *gluma intermedia* oblonga, obtusa, planiuscula; *glumæ internæ* minores, conformes, externis paullo breviores. *Fructus* compressus, orbicularis, *stylo* unico brevi, persistente coronatus. *Stigma* villoso plumosum.

A handsome species, with larger spikes than are usual among its congeners.

4. T. SPICIGERUS, *R. Brown, Prod.* p. 244; *Kunth, Enum.* iii. p. 441; *Steud. Synops.* ii. p. 260.—Restio spicigerus, *Thunb. Diss.* p. 11. n. 6, f. 5, 6.

Hab. Pr. B. Sp. Ex. sp. s. ♂, in planitie Capensi, *Ecklon*, 567!; *Masson*!

♀, *Drège*, 227!

♂ et ♀, *Eckl. et Zeyh.* 78. 4!; *Adml. Grey*!

In Linnæus's herbarium are two specimens of the female of *T. spicigerus*, with no name attached to them, but they bear the figures T. 457 and T. 369 respectively.

5. T. SCIRPIFORMIS, sp. n. Culmis simplicibus, teretibus, siccitate sulcatis; vaginis arctis, mucronatis, laceris; spiculis masculis 00, paniculatis, singulis parvis, ovato-oblongis; bracteis oblongis, mucronatis; glumis externis lateralibus anguste alatis; antheris apiculatis: spiculis femineis subglobosis, plurifloris, in cymam linearem spiciformem dispositis; bracteis oblongo-lanceolatis, mucronatis; glumis externis profunde alato-carinatis.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Ecklon et Zeyher*, 60. 5!

Culmi erecti, teretes, crassitie pennæ gallinaceæ, olivaceo-flavidi, obsolete impresso punctulati, siccitate longitudinaliter sulcati. *Vaginæ culmeæ* 1–1½-pollicares, arcte convolutæ, acuminatæ, mucronatæ, coriaceæ, fuscæ, nervoso-striatæ, ad margines pallidiores laceræ. *Panicula mascula* terminalis, cymosa, pluristachya, erecta. *Pedunculi* e vaginis supremis orti, glabri. *Spiculæ* ovato-oblongæ, plurifloræ, parvæ, 2–3 lin. longæ. *Bracteæ* undique arcte imbricatæ, oblongæ, coriaceæ, fuscæ, infimæ sub apice obtuso valide subulato-mucronatæ, superiores acuminato-mucronatæ, *flores* compressos arcuatos 2–3-plo superantes. *Glumæ* membranaceæ, ferrugineæ, *externæ laterales* naviculari-conduplicatæ, oblongæ, acutiusculæ, anguste alato-carinatæ; *gluma antica* conformis, planiuscula. *Glumæ internæ* paulo minores, conformes. *Antheræ* apiculatæ, inclusæ.—Plantæ femineæ

culmus et *vaginæ* ut in mare. *Spiculæ* 3–4, pluriflorae, subglobosæ, magnitudine pisi magni, in spicam cymosam, linearem, distichara, erectam dispositæ. *Bracteæ* oblongo-lanceolatæ, mucronatæ, ferrugineæ, coriaceæ, flores vix superantes. *Glumæ* oblongæ, membranaceæ, *externæ laterales* profunde alato-carinatæ, *intermedia* planiuscula. *Glumæ internæ* 3, conformes, gl. antica externa latiores, *postica* ad margines parum involuta. *Ovarium* compressum, suborbiculare, purpureum, *stigmate* lineari, incluso coronatum.

Very like a small form of *T. spicigerus*, as to the female plant; but the male spikelets are widely different from those of that species.

6. T. FRUTICOSUS, *Berg. Fl. Cap.* p. 353, t. 5. f. 8 (1767).—Restio dichotomus, *Linn. Syst. Nat.* ed. 12. tom. ii. p. 735, addenda (1766), nec *Rottboell.*—R. scariosus, *Thunb. Diss.* p. 15. 12?—Thamnochortus scariosus, *R. Brown, Prod.* p. 244 (1810); *Kunth, Enum.* iii. p. 430; *Steudel Syn.* ii. p. 259.—R. eriophorus, *Reichb. in herb. Sieber.*

Var. glaber. Culmis glabris, glumis lateralibus externis anguste alatis.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Sieber, Fl. Cap.* 230!; *Drège,* 130!; *Ecklon,* 84!; *Ludwig*!

♀, *Masson*!; in planitie Capensi, *Ecklon,* 28!; *Harvey*!, *Sieber*!, *Eckl. et Zeyher,* 85!

♂ et ♀, *Wright,* 499!; Uitenhage, *Ecklon,* 793!

Var. glaber, ♂, *Burchell,* 5642!, 5548?!

Of this plant, Bergius, *l. c.*, has given an excellent figure, so that there is no doubt as to the plant he intended. A manuscript note in Linné's own handwriting in a copy of the 12th edition of the 'Systema,' above cited, also shows that this is the species which Linné intended as the type of his genus *Restio* *.

The variety with glabrous stems seems only to differ from the type in the absence of a downy investment.

7. T. DICHOTOMUS, *Brown, Prod.* p. 244, adn.; *Kunth, Enum.* iii. p. 433.

Char. emend.—Culmis aliis simplicibus, aliis ramosis; ramis sterilibus plerumque brevioribus, ramosissimis, foliosis; vaginis arctis, acutato-mucronatis, apice laceratis et hyalino-aridis; panicula mascula cymosa, laxa, pedunculis fasciculatis, flaccidis, erectis vel demum plerumque patentibus pendulisve, vaginis laceratis suffultis; spiculis sessilibus et pedunculatis, oblongis, plurifloris; bracteis ovato-lanceolatis, acutato-subulatis, castaneis, florem 2-plo superantibus; glumis externis acutiusculis, anguste alatis, glumis internis obtusiusculis; antheris apiculatis: spiculis femineis 2–5, in apice culmi in cymam linearem spiciformem erectam dispositis, singulis rotundatis vel oblongis, glumis externis late alatis, fructibus subrotundo-obovatis.—♂. Restio dicho-

* See my remarks on this matter, 'Journal of the Linnean Society,' vol. viii. p. 212.

tomus, *Rottb. Desc. et Ic.* p. 2, t. 1. f. 1, nec *Linn.*—Thamnochortus dichotomus, *Kunth, Enum.* iii. p. 433 (excl. syn.).—Restio nutans, *Thunb. Fl. Cap.* i. p. 84?—R. Thamnochortus, *Thunb. Diss.* p. 15. n.13; *Fl. Cap.* p. 86.—R. paleaceus, *N. ab E. in herb. Sonder.*, pro parte!—Thamnochortus consanguineus, *Kunth, Enum.* iii. p. 432.—T. bromoides, *Kunth, Enum.* iii. p. 432.—♀, Thamnochortus Ecklonianus, *Kunth, Enum.* iii. p. 430.

Hab. Pr. B. Sp. Ex. sp. s. ♂, False Bay, *Robertson*!, *Dr. Lind.*!, *J. R. et G. Forster*!, *Sieber, Fl. Cap.* 116!, 223!, 225!; *Burke*!; *Burchell*, 525!, 333!, 6033!; *Ecklon*, 29!, 30!, 84!, 78!; in planitie Capensi, 561!; Muisenberg, 791!; *Drège*, 133!, 135!, spec. juvenilia, 138!; *Dr. Thom*, 1030!; *Admiral Grey*!

♀, *Bergius*!, *Burchell*, 924!, 7595!; *Ecklon*, 83!, 84!; *Ecklon et Zeyher*, 56. 5!, 56. 6!, 61. 5!; *Zeyher*, 989!; *Drège*, 138 a!; Cape Town, *Harvey*!

♂ et ♀, *Zeyher*, 1741!; *Ecklon*, 792!, (Table Mount.) 838!, 941!; *Eckl. et Zeyh.* 1. 11!, 1. 12!, 55. 7!; *Sieber, Fl. Cap.* 114!

Rhizoma repens, crassitie pennæ anserinæ, dense squamatum, squamis approximatis spadiceis. *Culmi* cæspitosi, teretes, 1½–3-pedales, crassitie pennæ gallinaceæ, olivaceo-flavidi, subtilissime lepidoto-punctulati; *fertiles* simplices vel ramis paucis semiteretibus ramosissimis foliosis instructi; *steriles* multo breviores, ramosissimi, foliosi, foliis subulatis brevibus. *Vaginæ culmeæ* arctæ, coriaceæ, fuscæ, striatæ, acutato-mucronatæ, superne laceratæ, 1½-pollicares. *Vaginæ ramulorum* in folium subulatum productæ, sub apice villoso laciniatæ. *Panicula mascula* terminalis, cymosa, laxa, pluristachya, pedunculis fasciculatis, flaccidis, imprimis erectis, demum patentibus vel pendulis. *Spiculæ* sessiles v. pedunculatæ, cylindraceo-oblongæ, multifloræ, 5–6 lineas longæ, *spathis* lamellato-laceratis, vaginis simillimis, suffultæ. *Bracteæ* imprimis undique arcte imbricatæ, tandem versus apicem laxiuscule patentes, oblongo-lanceolatæ, acutato-subulatæ, coriaceæ, uninerviæ, castaneæ, margine hyalino-albidæ, flores stipitulatos oblongos compressos duplo superantes. *Glumæ* subæquilongæ, *externæ laterales* naviculari-carinatæ, acutiusculæ (juventute submucronulatæ), carina anguste alata, ferrugineæ, glabræ, rigidiusculæ; *glumæ internæ* oblongo-obtusiusculæ, planiusculæ, externis tenuiores. *Antheræ* lineari-oblongæ, apiculatæ, inclusæ, filamentis vix longiores.—*Spiculæ femineæ* in apice culmi, 2–5, parum remotæ, erectæ, multifloræ, sessiles, nunc ex geminis infimis altera pedunculata, ellipticæ vel subrotundæ, 6–8 lineas longæ, singulæ spatha vaginæformi suffultæ. *Bracteæ* ut in mare, florem 2–3-plo superantes. *Glumæ* subæquilongæ, *externæ laterales* naviculari-carinatæ, carina late alata, alis membranaceis ferrugineis; *glumæ internæ* obtusæ, tenuiores, subhyalinæ. *Ovarium* ..... *Fructus* monospermus, subrotundus vel obovatus, *stylo* brevi terminatus, turgide lenticularis, hinc planiusculus inde convexus, castaneo-fuscus, apicem versus punctulato-scabriusculus, durus, nucumen-

taceus, calyce persistente arcte obtectus, ejus fundo adnatus eumque longitudine subæquans, indehiscens. (Descr. fruct. ex cl. *Kunth*.)

The male plant is in the Linnean herbarium, under the name of *Restio vimineus*, the name *R. dichotomus* having also been attached to it in Linné's handwriting, and subsequently erased. The female plant is also called *R. vimineus* in the same herbarium. The lanceolate bracts and lacerated sheaths serve to distinguish this species from its near allies.

8. T. GIGANTEUS, *Kunth, Enum*. iii. p. 435; *Steud. Synops*. ii. p. 259.
Hab. Pr. B. Sp. Ex. sp. s. ♂, *Burchell*, 5711-12!, 6994!; *Drège*, 2!
Femina latet.

9. T. FLORIBUNDUS, *Kunth, Enum*. iii. p. 435, ♂; *Steud. Synops*. ii. p. 259.
Species mihi ignota. An *T. elongato* referenda?

10. T. STRIATUS, *Hochst. Flora*, 1845, p. 339; *Steud. Syn*. ii. p. 260.
Planta feminea *cl. Hochstett., loc. cit.*, descripta, mihi ignota.

** *Styli* 2–3 (Staberohæ species, *Kunth*).

11. T. IMBRICATUS.—Restio imbricatus, *Thunb*. p. 9. no. 1, f. 1.—Leptocarpus imbricatus, *Brown, Prod*. p. 250.—Restio spicigerus β, culmo monostachyo, *Nees ab Esenb. Linnæa*, v. p. 647, *fide spec. authent. in herb. Sonder*.—Staberoha imbricata, *Kunth, Enum*. iii. p. 442, *quoad femineam*.—Thamnochortus æmulus, *Kunth, Enum*. iii. p. 439, *quoad masculam*.

Var. stenopterus. Glumarum externarum lateralium carinis anguste alatis.—Staberoha stenoptera, *Kunth, Enum*. iii. p. 443.—Restio tetrasepalus, *Steudel, Synops*. ii. p. 251. An huc Restio simplex, *Thunb. Diss*. n. 15?

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Eckl. et Zeyh*. 56. 6!, 1. 11!; *Eckl*. 588!; *Drège*, 1652!; *Wallich*!

♀, *Burchell*, 6319!, 7931!; *C. Wright*, 493!; *Drège*, 29!; *Eckl. et Zeyh*. 83!; *Maton*!, *Dr. Lind*.!; Simon's Bay, *Milne*, 433!; *Dr. Thom*, 908!

Var. stenopterus, ♂, *Admiral Grey*!

♀, *Drège*, 27!, 1636!; *Wallich*!

The deep wing to the carina in this species is sometimes ferruginous, at other times hyaline, while in the variety *stenopterus* it is much narrower than in the type. Setting apart this distinction, however, I can find no valid marks of separation between the two forms, which accordingly I combine. In Linné's herbarium, under the name "*simplex*," is a female plant of the variety *stenopterus*. Whether or no this be the *Restio simplex* of Thunberg I have no means of ascertaining. Some of Drège's specimens issued under n. 27 have the upper portions of the bracts de-

stroyed, and in so regular a manner that the plant possesses a very different aspect to the other specimens. In other matters, however, there is no difference.

12. T. UMBELLATUS, *Kunth, Enum.* iii. p. 440; *Steud. Synops.* ii. p. 260.
Char. emend.—Culmis teretibus, papulosis, vaginis arctis sub apice mucronatis, pedunculis laxis, pendulis, 2–3-stachyis; spiculis masculis oblongis vel obovatis, complanatis; bracteis oblongo-lanceolatis, planiusculis; glumis oblongis, acutis, externis lateralibus anguste alatis: spiculis femineis solitariis vel geminis, erectis, cylindraceo-oblongis; bracteis squarrosis, oblongo-lanceolatis; glumis oblongis, lateralibus externis alato-carinatis; ovario turbinato, stylis 3, intus stigmatosis, exsertis superato.—Restio umbellatus, *Thunb. Diss.* p. 11. n. 5. f. 3. —Restio distachyos, *Rottb. Desc. et Ic.* p. 8, t. 3. f. 5, *quoad femineam.* —Leptocarpus distachyus, *Brown, Prod.* p. 250.—Staberoha? distachya, *Kunth, Enum.* iii. p. 444.
Hab. Pr. B. Sp. Ex. sp. s. ♂, *Eckl. et Zeyh.* 78. 8!; *Drège,* 23! ♀, *Admiral Grey*!
Culmi bipedales et ultra, erecti, teretes, simplices, rigidiusculi, crassitie pennæ corvinæ, papulosi, rugulosi. *Vaginæ* arcte convolutæ, sesquipollicares, coriaceæ, fuscæ, nervoso-striatæ, superne membranaceæ, sub apice acutiusculo mucronatæ. *Pedunculi* e spatha terminali erecta, gemini, laxi, penduli, 2–3-stachyi. *Spiculæ masculæ* oblongæ vel obovatæ, complanatæ, 5–6 lineas longæ. *Bracteæ* undique arcte imbricatæ, oblongo-lanceolatæ, mucronatæ, ferrugineæ, planiusculæ, *flores* arcuatos oblongos 2–3-plo superantes. *Glumæ* oblongo-acutæ, *laterales externæ* cymbiformes, carinatæ, carina anguste alata, *intermedia* planiuscula; *internæ* conformes, tenuiores, minores. *Antheræ* inclusæ, apiculatæ, flavidæ.—Plantæ femineæ *culmi vaginæque* ut in mare. *Spiculæ* in apice culmi 1 vel 2, erectæ, cylindraceæ vel oblongæ, plurifloræ, 1–2-pollicares, sing. spatha bracteiformi acuminato-mucronata suffultæ. *Bracteæ* squarrosæ, oblongo-lanceolatæ, coriaceæ, concavæ, fuscæ, nervoso-striatæ, *flores* compressos 3–4-plo superantes. *Glumæ externæ laterales* arcuatæ, oblongæ, acutatæ, conduplicatæ, alato-carinatæ, carina integra; *gluma antica* oblongo-obtusa, planiuscula, dorso nervo medio notata. *Glumæ internæ* planiusculæ, oblongo-lanceolatæ, *postica* ad margines parum involuta. *Ovarium* turbinatum, compressum, coriaceum, 1-loculare, *stylis* 3, intus stigmatoso-villosis, exsertis superatum.

The male plant differs from *T. cernuus* in its oblong not rounded spikes, as also in its more pointed and flattened bracts. Rottboell describes the female plant as having two stigmas only.

13. T. CERNUUS, *Kunth, Enum.* iii. p. 439, *mas tantum.*—Restio cernuus, *Thunb. Diss.* p. 10. n. 4, f. 2.—R. spicigerus, *Lam. Ill.* t. 804. f. 2?
Hab. Pr. B. Sp. ♂, *Thunberg in herb. Banks.*!, *Krebs*!, *Eckl. et*

Zeyh. 1. 12!, 55. 7!; *Ecklon*, 11!, 841!; *Burchell*, 340!; *Drège*, 24!; *C. Wright*, 490!, 492!; *Admiral Grey*!, *Burke*!, *Milne*, 217!

♀, *Drège*, 29!, 83!; *Burchell*, 6963!?, 196?; Simon's Town, *Wright*, 494!

Plantæ femineæ, hucusque non observatæ, *culmus* (bipedalis) *vaginæque* ut in mare. *Spiculæ* in apice culmi solitariæ vel geminæ, pluriflore, cuneato-oblongæ, 6–8 lin. longæ, 2–3 lin. latæ. *Bracteæ* laxe imbricatæ, oblongo-lanceolatæ, concavæ, coriaceæ, spadiceæ, *flores* suborbiculares compressos 3–4-plo superantes. *Glumæ* membranaceæ, lineis ferrugineis notatæ. *Glumæ externæ laterales* oblongo-obtusæ, conduplicatæ, profunde alato-carinatæ, carina membranacea lacerata; *gluma intermedia antica* oblonga, obtusa, membranacea, ad margines lacerata, superne ad dorsum fimbrillifera, nervo medio notata. *Glumæ internæ* 3, oblongæ, acutiusculæ, membranaceæ, laceratæ. *Fructus* oblongus, obtusus, coriaceus, superne lineo flavido notatus, unilocularis, monospermus, indehiscens. *Styli* 3, distincti, exserti, liguliformes, intus villoso stigmatosi.

The long flattened tubercles on the culms of this plant, both male and female, resemble much the eggs of some moth. Branched, leafy, sterile culms are occasionally to be met with, as usual, shorter than the fertile culms. The structure of the glumes in the female plant is singular. The intervals between the constituent cells are marked out by raised ferruginous lines, giving the appearance of a network. The edges, too, of the glumes are more or less deeply cut, while on the back of the anterior glume is often (but not always) to be seen a little tuft of fine hairs.

14. T. DISTICHUS.—Restio distichus, *Rottb. Descr. et Ic.* p. 6. n. 6, t. 2. f. 5, *aliorumque* (*planta mascula*).—R.? punctulatus, *Nees* ex *Mast. Journ. Linn. Soc.* viii. 242, *quoad femineam.*

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Burchell*, 7040!; *Zeyher*, 35!?, 1737!; *Eckl. et Zeyh.* 1. 12!, 77. 9; *Eckl.* sine numero!

♀, *Zeyher*, 1737!

The examination of Burchell's more perfect specimens has shown that what I had called, following Nees, *Restio? punctulatus*, is a true *Thamnochortus* (sect. *Staberoha*), and that it is the female plant of Rottboell's *Restio distichus*.

Species excludendæ.

T. ECKLONIANUS=T. dichotomus, *R. Br.*

T. SCARIOSUS, *R. Br.*=T. fruticosus, *Berg.*

T. CONSANGUINEUS, *Kunth*=T. dichotomus, *R. Br.*

T. BROMOIDES, *Kunth*=T. dichotomus, *R. Br.*

T. MODESTUS, *Kunth*=Leptocarpus modestus, *Mast.*

T. ROBUSTUS, *Kunth*=Cannamois virgata ♂, *Steud.*

T. VIRGATUS, *Kunth*=Cannamois virgata ♂, *Steud.*

T. STRICTUS, *Kunth*=Cannamois simplex ♂, *Kunth.*

T. ÆMULUS, *Kunth*=T. imbricatus ♂.

T. MICANS, *Kunth*=Restio micans, *Nees.*

CANNAMOIS, *Beauv. Ann. Sc. Nat.* 1828, p. 43; *Kunth, Enum.* iii. p. 447.

Mesanthus, *Nees ab Esenb. in Lindl. Intr. Nat. Syst. Bot.* ed. 2 (1836), p. 451; *Kunth,* l. c. 484.

Cuculligera, *Nees ab Esenb. in Lindl. Intr. Nat. Syst. Bot.* ed. 2 (1836), p. 451; *Kunth,* l. c. 484.

1. C. VIRGATA, *Steud. Synops.* ii. p. 263.—Culmis fistulosis, virgato-ramosissimis; ramis ramulisque solitariis vel subfasciculatis, teretibus v. compressis; vaginis arctis, subulato-acuminatis; panicula mascula ramosissima, subconferta, oblonga; spiculis sessilibus vel breviter pedicellatis, ovato-ellipticis vel oblongis; bracteis ovatis, acuminato-mucronatis, vel submuticis, ferrugineis, apice margineque hyalinis, flores vix superantibus; glumis ovatis, obtusis; antheris muticis: spiculis femineis in apice ramulorum solitariis vel ternis, ovato-oblongis; bracteis coriaceis, rigidis, infimis sterilibus, mediis 2–3 fertilibus, supremis abortivis; perianthio 6-glumi, glumis hyalinis; ovario stipitulato, compresso, 1-loculari; stylis duobus, elongatis; fructu osseo, compresso.

♂. Restio virgatus, *Rottb. Descr. et Ic.* p. 5, t. 1. f. 2 (1773), *Thunb. Diss.* n. 24.—R. Scopa, *Thunb. Diss.* p. 20. n. 23 (1778).—Restio elegans, *Poiret, Encyc.* vi. 171 (1804).—Elegia paniculata, *Persoon, Synops.* ii. p. 263 (1805), *fide synonym.*—Thamnochortus robustus, *Kunth, Enum.* iii. p. 436 (1841); *Steud. Synopsis,* ii. p. 263.—T. virgatus, *Kunth, l. c.*; *Steud. l. c.*

♀. Willdenovia compressa, *Thunb. fide Nees, sed certe non.*—Cannamois cephalotes, *Beauv. Ann. des Sc. Nat.* (1828), p. 43, t. 3. f. 1; *Steud. Syn.* ii. 263.

♂ et ♀. Mesanthus macrocarpus, *Nees* (*char. gen. et nomen specific.*) *in Lindl. Nat. Syst. Bot.* ed. 2. p. 451 (1836), *et in herb. Sonder.*; *Kunth, Enum.* iii. p. 485; *Steud. Synops.* ii. p. 264.

Species insignis, statura, inflorescentia formaque bractearum spicularum mascularum sat variabilis.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Masson*!; Uitenhage, *Eckl. sine numero*!; Witsenberg, *Zeyher*, n. 1738!; Voormansbosch, *Zeyher* (*Octr.*), n. 4345!; *Burchell,* 5810!, 7163!; *Drège,* 139!

♀, *Burchell,* 5811!; *Eckl. et Zeyh.* l. 11!, l. 12!; *Drège,* 1635 b!

♂ et ♀. Duivelsbosch, *Eckl. et Zeyh.* 91!; *Drège,* 1606!; *Burchell,* 7139!, 8697!; *Masson*!

Culmi erecti, 5–12-pedales et ultra, teretes, crassitie pennæ cygneæ, fistulosi, subfasciculatim ramosissimi, rami ramulique compressi, semiteretes, olivacei, impresso punctulati. *Vaginæ culmeæ* 2–3-pollicares, arcte convolutæ, coriaceæ, striatæ, fuscæ, acuminato-mucronatæ, ad margines tenuiores concolores. *Vaginæ rameales* conformes, magnitudine minores, in aristam terminalem, tenuem, longiusculam desinentes. *Panicula mascula* terminalis, erecta, oblonga, 2–6-poll. longa, magis minusve conferta, ramosissima; rami maximi basi *spathis* vaginiformibus, apertis, ipsos æquantibus tandem deciduis suffulti; ramuli graciles, spiculas æquantes vel eis breviores, basi *spathellis* oblongis, membranaceis, sub apice demum bilobato longe acuminatis. *Spiculæ* oblongæ, obtusæ vel acutiusculæ, 3–4 lin. longæ. *Bracteæ* undique arcte imbricatæ, ovato-oblongæ, acuminato-mucronatæ, vel submuticæ, castaneæ v. ferrugineæ, margine apiceque hyalino-albidæ, *flores* stipitulatos oblongo-ovatos vix superantes. *Perianthium* biseriale, sex-glume, *glumis* inæqualibus oblongo-obtusis, ferrugineis, *externis* brevioribus, *lateralibus* naviculari-conduplicatis, carinatis, carina glabra, *intermedia antica* planiuscula, *internis* membranaceis, hyalinis. *Antheræ* oblongæ, muticæ, dorso ferrugineæ. *Spiculæ femineæ* nunc in apice ramorum solitariæ, nunc in apice culmi 2–3, sessiles, 1–2-poll. longæ, oblongo-subclavatæ, basi attenuatæ, *spatha* aperta, vaginiformi, brevi, persistente suffultæ, 2–5-floræ. *Bracteæ* arcte trifariam imbricatæ, oblongo-ovatæ, acuminatæ, cymbiformes, coriaceæ, fuscæ, margine hyalino-membranaceæ, nitidæ, exteriores gradatim breviores, mediæ 2–5 fertiles, summæ steriles, terminalis convoluta. *Flores* 4–5 stipitulati, quorum 2–3 perfecti, cæteri abortivi. *Perianthium* basi tubulosum, cupuliforme, superne in lacinias vel glumas 6 divisum, *glumis* 3 externis, 3 internis, subæqualibus, oblongis, obtusis, hyalinis, fructui arcte appressis vel agglutinatis, eoque vix brevioribus, basi, demum, inter se nec non a stipite disjunctis ita ut tubus perianthii evanescit. *Ovarium* ovatum compressum, 1-loculare (adjecto altero loculo minore vacuo ?, *Beauv.*), superne disco epigyno annulari carnoso notatum. *Styli* duo distincti, longiusculi, liguliformes, intus villoso stigmatosi. *Fructus* oblongo-ovatus, altero latere planus v. concavus, altero convexus, osseus, olivaceus vel nigrescens, lævis, 1-locularis, 1-spermus.

The male plant of this species was first described by Rottboell, under the name of *Restio virgatus*. Many years after, Desvaux and De Beauvois described and figured the female plant under the name of *C. cephalotes*. There can now be no doubt that the two plants here referred to form the male and female of one species; the numerous specimens of both sexes from various collectors, often collected together, amply show this. At first sight it would be easy to distinguish at least two well-marked varieties (species ?), the one with a compact male inflorescence and sharply

pointed spikelets and bracts, the other with more loosely grouped, blunter spikelets, and with thinner nearly obtuse bracts; but on closer examination it will be found that the two forms run one into the other, and that in some instances, on the same specimen, obtuse scarcely mucronate bracts may be found with others that are strongly acuminate. The species is thus very variable in size, luxuriance of inflorescence, and shape of the bracts. Under these circumstances, I have followed Nees's example, who (Linnea, v. p. 645, under *Restio elegans*) says of *R. elegans*, *Elegia paniculata*, *R. virgatus*, *R. scopa*, "Species hæ supra citatæ certe ejusdem speciei varietates sunt," &c.

The structure of the female flowers is not easy to make out in the dried specimens, though, no doubt, an examination of the living plant would at once show the true structure. From the specimens examined, I believe the perianth to be tubular at the base, and to be divided above into six glumes, which become agglutinated to the sides of the ovary, and which after a time become separated at the base both from one another and from the stipes of the fruit. Hence, in the earlier stages, there is an appearance of a cup-like disk surrounding the base of the flower, but which, as the fruit ripens, disappears completely. It is much to be desired that some local observer would carefully examine the fresh flowers from their earliest stage to their fullest development. In some specimens, distributed by Drège under his n. 1606, the female flowers were provided with three stamens, aud were thus rendered hermaphrodite.

It was not till after I had examined this species and its congeners that I found that Hochstetter, Flora, 1845, p. 348, had expressed the same opinion as to the synonymy of this and other species of this genus.

2. C. SCIRPOIDES.—Culmis erectis, fistulosis, teretibus v. subcompressis, parum dichotome ramosis; vaginis arcte convolutis, vix pollicaribus, mucronatis; spiculis masculis numerosis, subglobosis, in cymam paniculiformem terminalem, spathis magnis deciduis interstinctam, dispositis; bracteis arcte imbricatis, lanceolatis, acuminatis; floribus ovatis: spiculis femineis in apice culmi, solitariis vel geminis, ovato-oblongis, 1–1½-pollicaribus; floribus paucis, unico laterali maturescente; glumis 6, æqualibus, oblongis, membranaceis, fructui oblongo subcompresso, nigro, lævi appressis.—Thamnochortus scirpoides, *Kunth, Enum.* iii. p. 438.—Mesanthus Ricinus, *Nees ab Es. MS. in herb. Sonder., absque descript.*

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Eckl. et Zeyh.* 1. 11!, 55. 8!; Gr. Houhoek, *Zeyher*, n. 4337!; *Drège*, 100!, 2023!; *Burchell*, 7874!

♀, *Eckl. et Zeyh.* 51. 8!; *Burchell*, 7960!

Rhizoma **repens, crassitie pennæ anserinæ, squamis ovatis, striatis, fuscis, coriaceis, ad margines tenuioribus dense vestitum. *Culmi* erecti, strictissimi, bipedales et ultra, crassitie pennæ gallinaceæ, teretes, fistulosi, simplices vel versus medium dichotome ramosi, ramique erecti virgati, elongati, compressiusculi, olivacei, purpureo maculati. *Vaginæ culmeæ* pollicares et ultra, arcte convolutæ, coriaceæ, fuscæ, striatæ, ad margines membranaceæ, superne subulato-mucronatæ. *Spiculæ* masculæ nnmerosæ, subglobosæ, compressiusculæ (?), sing. 2–3 lin. longæ, 1–2 lin. latæ, in cymam compositam paniculiformem terminalem aggregatæ, sessiles v. pedicellatæ, pedicellis tenuibus. *Spathæ* 3–4, magnæ, ellipticæ, acutatæ, coriaceæ, ferrugineæ, nitentes, imprimis cymæ ramulos omnino velantes, demum deciduæ. *Bracteæ* arcte imbricatæ, oblongæ, longe acuminatæ, subcoriaceæ, ferrugineæ, ad margines utrinque pallidæ, membranaceæ, *flores* ovatos arcuatos triplo superantes. *Perianthium* biseriale, 6-glume, *glumis* membranaceis, ovatis, apiculatis, *externis* ferrugineis, *internis* pallidioribus, minoribus; *Filamenta* pallida. *Antheræ* demum exsertæ, oblongæ, apiculatæ, dorso flavidæ.—Plantæ femineæ *culmus vaginæque* ut in mare. *Spiculæ* solitariæ vel geminæ, sessiles vel pedicellatæ, sing. ovatæ, oblongæ, 1–1½ poll. longæ, 5–6 lin. latæ, basi spatha aperta vaginiformi ipsas subæquante suffultæ, 2–3-floræ ?, flore unico maturescente. *Bracteæ* imprimis arcte imbricatæ, concavæ, oblongæ, acuminato-aristatæ, coriaceæ, rigidæ; bractea terminalis sterilis arcte convoluta, stipiti brevi imposita. *Perianthium* sexglume, *glumis* biserialibus æqualibus, oblongo-obtusis, membranaceis, fuscis, *fructum* oblongum, compressum nigrescentem, lævem, unilocularem, stipitulatum æquantibus eoque arcte appressis. *Semen* unicum, pendulum, testa membranacea. *Flores* juveniles nondum vidi.**

Nees von Esenbeck labelled this plant in Dr. Sonder's herbarium *Mesanthus Ricinus*, but I am not aware that he ever published the name or described the species. The great similarity in form and colour to the smaller seeds of *Ricinus communis* no doubt led Nees to employ this designation. The male plant, described by Kunth as *Thamnochortus scirpoides*, does not differ from Nees's plant.

3. C. SIMPLEX, *Kunth, Enum.* iii. p. 448.—Culmis 1–2-pedalibus, simplicibus vel parce dichotome ramosis, fistulosis, teretibus v. compressis, strictis, siccitate longitudinaliter striatis; vaginis arctis acuto-mucronatis, longitudinaliter striatis; panicula mascula oblonga, subconferta, spiculis ovato-ellipticis; bracteis late ovatis, acuminato-subulatis; glumis oblongis, obtusiusculis: spiculis femineis in apice culmi 3–4, sessilibus, ellipticis, singulis spatha vaginiformi spiculam superante suffultis; bracteis ovato-oblongis, acuto-mucronatis, exterioribus gra-

datim brevioribus, vacuis, penultima fertili (nunc 1–3 fertilibus), terminali minore sterili, cucullatim convoluta; stylis 2.

♂. ?Restio acuminatus, *Thunb. Diss.* p. 13, n. 8, *fide N. ab E. Linnæa*, v. p. 652. adn. 3.—Cuculligera dura, *Nees ab Esen. in Lindl. Nat. Syst.* ed. 2. p. 451.—Thamnochortus strictus, *Kunth, Enum.* iii. p. 438; *Steud. Synops.* ii. p. 259, *quoad marem.*

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Thunberg in herb. Banks.*!, *Drège*, 101!; Tulbagh, *Eckl. sine numero*!

♀, *Drège*, n. 2514!

♂ et ♀. Brakfontein (August), *Eckl.* n. 76!

Rhizoma repens, teres, sublignosum, crassitie pennæ anserinæ, squamis nitidis, arcte appressis vestitum. *Culmi* erecti, 1–3-pedales, teretes, fistulosi, stricti, simplices vel parum dichotome ramosi, cinerascentes, purpureo maculati, striatulati, punctulati, ad basin vaginis arctis, tubulosis, coriaceis, approximatis suffulti, superne remote vaginati. *Vaginæ culmeæ* pollicares, arcte convolutæ, ellipticæ, coriaceæ, striatæ, ad margines membranaceæ, sub apice obtusiusculo tenui, subulato-mucronatæ. *Spiculæ masculæ* 00, in cymam terminalem, paniculatam, pluriramosam, oblongam, 1½–2½-pollicarem, *spathis* magnis vaginiformibus, apertis, striatis, demum deciduis interstinctam dispositæ, singulæ multifloræ, 1–2 lin. longæ, ovato-ellipticæ, sessiles vel breviter pedicellatæ, *pedicellis* gracilibus. *Bracteæ* undique arcte imbricatæ, late ovatæ, subulato-acuminatæ, castaneæ, margine hyalino-albidæ, flores rotundatos superantes. *Perianthium* biseriale, sexglume; *glumæ externæ* 3, pallide castaneæ, oblongæ, acutæ, *laterales* naviculari-conduplicatæ, *tertia* lata planiuscula; *glumæ internæ* paulo breviores, æquales, oblongæ, obtusciusculæ, hyalinæ. *Antheræ* apiculatæ.—*Spiculæ femineæ* in apice culmi, 2–3, sessiles, rachi complanata flexuosa, distiche dispositæ, oblongæ, ellipticæ, semipollicares et ultra, singulæ vagina spathiformi aperta parum longiore suffultæ, medio 1–3-floræ. *Bracteæ* undique arcte imbricatæ, oblongæ, acutæ, mucronatæ, coriaceæ, castaneæ, inferiores gradatim breviores, vacuæ; *bractea terminalis* sterilis, stipitulata, cucullatim convoluta. *Flores perfecti* plerumque solitarii, nunc 2–3, laterales. *Perianthium* imo basi tubulosum, superne profunde 6-sectum, *segmentis* æqualibus, oblongis, obtusis, hyalinis, nervo medio prominente notatis, fructui appressis. *Ovarium* sessile, ovatum, 1-loculare (adjecto loculo minore, teste *Kunth*, *l. c.*), 1-ovulatum. *Styli* 2, filiformes, complanati, decidui. *Fructus* oblongus, obtusus, compressiusculus, durus, olivaceus, lævis, 1-locularis, 2–3 lin. longus, perianthio persistente appresso cinctus.

Specimens in the British Museum, from Thunberg, seem to show that this is the plant published by that author as *Restio acuminatus*; on the other hand, in the 'Flora Capensis,' Thunberg cites as a synonym of this species Rottboell's *Chondropetalum nudum*, which is quite a different plant.

ELEGIA, *Linn. Mantissa Plant. altera*, p. 297 (anno 1771); *Kunth, Enum.* iii. p. 460, pro parte.

Chondropetalum, *Rottb. Descr. et Ic.* p. 10 (1773).

CHAR. EMEND.—Inflorescentia mascula et feminea conformis, vel vix difformis, spathis magnis, apertis, demum deciduis, munita. Flores dioici, fasciculato- vel spicato-congesti, singuli triangulares vel raro compressi, sessiles vel vix pedicellati, bractea breviore stipati. Perianthium biseriale, 6-glume, glumæ exteriores inter se æquales, internis (præcipue in fl. masc.) breviores. Stamina 3, distincta; filamenta filiformia; antheræ uniloculares, dorso supra basin affixæ, antice secundum longitudinem dehiscentes. Pistilli rudimentum minutum, 3-stylum, vel nullum.—*Femina*. Glumæ externæ nonnunquam internis aquilongæ. Staminodia nulla. Ovarium sæpissime 1-loculare, nonnunquam 2–3-loculare, loculis uniovulatis. Styli 3, lineares, distincti, intus stigmatoso-villosi. Fructus unilocularis, indehiscens, triangularis, raro compressus, bilocularis (*E. squamosa*).—Rhizoma repens, squamatum. Culmi juncei, simplices vel ramosi, vaginis plerumque cito deciduis et annulum nigrum relinquentibus instructi. Inflorescentia conferte cymoso-paniculata, ramis vagina spathiformi, plerumque cito decidua, suffultis.—*Kunth, op. cit.* (excl. spec. capsulis dehiscentibus).

1. E. DEUSTA, *Kunth, Enum.* iii. p. 460; *Steud. Synops.* ii. p. 261.—Chondropetalum deustum, *Rottb. Descr. et Ic.* p. 10, t. 3. f. 2.—Restio tectorum, *Thunb. Fl. Cap.* i. p. 85, *non Linn.*—R. Chondropetalum, *N. ab E. Linnæa*, v. p. 652.

Hab. Pr. B. Sp. ♂, in planitie montis Tabularis, *Bergius*!, *Eckl.*!, *ejusdem* nn. 224!, 839!; *Sieber*, 226!; *Burchell*, 565!, 8114!; *Reichenbach, in herb. Fielding.*!; *Drège*, 123!

♂ et ♀, *Eckl. et Zeyh.* 56. 6!

Plantæ femineæ adhuc indescriptæ notas adjicio.

Culmus, vaginæ, nec non inflorescentia omnino ut in mare. *Spiculæ* subglobosæ, 3–4-floræ. *Bracteæ* arcte imbricatæ, ovato-oblongæ, subulato-mucronatæ, concavæ, coriaceæ, brunneæ. *Flores* arcuati, oblongi, subtrigoni, bracteas duplo triplove superantes. *Perianthium* rigidum, biseriale, sexglume. *Glumæ externæ* ovato-oblongæ, acutæ, concavæ, subcarinatæ, glabræ; *glumæ internæ* oblongæ, acutæ, arcuatæ, concavæ, externis duplo longiores. *Staminodia* 3, liguliformia. *Ovarium* oblongum, trigonum, purpureum, uniloculare, *stigmatibus* 3 villosis revolutis superatum. *Fructus*. . . . .

Specimens of this species exist in the Linnean herbarium; one of them is referred, in the handwriting of Linné, to "*Chondropetalum deustum*, Fris.," *i. e.* Rottboell.

2. E. NUDA, *Kunth, Enum.* iii. p. 462; *Steud. Synops.* ii. p. 261.—Chon-

dropetalum nudum, *Rottb. Descr. et Ic.* p. 11, t. 3. f. 3 (*femina*).—? Restio acuminatus, *Thunb. Fl. Cap.* i. p. 85.—R. nudus, *Nees ab Esenb. Linnæa*, v. p. 651, *pro parte, excl. vars.* α, β et γ.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Eckl.* 85!; ? *E. et Zeyh.* 51.8!; ? *Drège*, 147 b.

♀, *Sieber, Herb. Cap.* 111, *sub nom.* Restionis tectorum!; *Eckl.* 14!, ?84!, 796!; *Drège*, 9454!

Stirpis masculæ hucusque indescriptæ *culmus vaginæque* ut in feminea. *Panicula* oblonga, conferta, cymosa, terminalis, pluristachya, 2–3-poll. longa, *spathis* oblongo-lanceolatis, coriaceis, deciduis interstincta. *Bracteæ* late ovatæ, mucronatæ, coriaceæ, spadiceæ, *floribus* oblongis subtrigonis 1–2 lin. longis dimidio breviores. *Glumæ externæ* 3, ovatæ, acutæ, carinatæ, coriaceæ, spadiceæ, impresso-punctulatæ; *glumæ internæ* 3, ovato-oblongæ, externis duplo longiores, rigidæ, pallidæ. *Antheræ* inclusæ, lineares.

Of the varieties referred by Nees von Esenbeck to this species, *loc. cit.*, α and β belong to *Elegia racemosa*, as authentic specimens in Dr. Sonder's herbarium show, and, indeed, as is therein attested by Nees himself; var. γ is the male plant of *Dovea macrocarpa*, Kunth, while var. δ, about which Nees expresses some doubts, is the only one which properly belongs to *E. nuda*.

3. E. CUSPIDATA, sp. n. Culmis simplicibus, farctis, vaginis culmeis 2–3-pollicaribus, deciduis; spiculis masculis 1-floris, in paniculam compactam, terminalem, oblongam dispositis; spathis demum deciduis; bracteis ovatis, cuspidatis, flores subtrigonos (cuspide excepta) vix æquantibus; glumis rigidis, internis longioribus; antheris linearibus, apiculatis; fructu oblongo, trigono, 1-loculato, indehiscente, stylorum vestigiis coronato.

Hab. Pr. B. Sp. Ex. sp. s. ♂, False Bay, *Robertson*!; Table Bay, *Milne*! ♂ et ♀, *C. Wright*, 484, *in herb. Coll. S. Trin. Dubl.*!

♀, Simon's Bay, *McGillivray*!

Culmus, ut videtur, 2–3-pedalis, erectus, simplex, subcompressus, farctus, olivaceus, impresso-punctulatus. *Vaginæ culmeæ* 2–3-pollicares, laxiuscule convolutæ, ellipticæ, mucronatæ, coriaceæ, fuscæ, ad basin nigræ, nitidæ, demum deciduæ. *Spiculæ* masculæ 00, unifloræ, in paniculam congestam, oblongam, terminalem, 2–3-poll. longam, *spathisque* apertis, vaginiformibus, tandem deciduis, interstinctam dispositæ. *Bracteæ* late ovatæ, coriaceæ, fuscæ, apice longissime cuspidatæ, cuspipide patente. *Flores* subtrigoni, bracteis (cuspidibus exceptis) longiores. *Glumæ externæ* æquales, rigidæ, oblongæ, acutæ, concavæ, dorso superne nervo medio glabro notatæ. *Glumæ internæ* oblongo-lanceolatæ, concavæ, externas duplo superantes. *Antheræ* inclusæ, oblongæ, apiculatæ, flavidæ, dorso ferrugineæ, filamentis vix breviores. *Pistilli rudimentum* tristylum vel nullum. *Panicula* feminea ut in mare, sed minus ramosa. *Bracteæ glumæque* ut in mare. *Ovarium*....

Fructus oblongus, trigonus, nitidus, nigrescens, osseus, indehiscens, 1-locularis, stylorum vestigiis coronatus.

A very distinct species, recognizable by the long points to the bracts. The inflorescence has much the general aspect of some dark-brown or blackish coarse fur.

4. E. JUNCEA, *Linn. Mant.* 297 (1771).

Char. emend.—Culmis simplicibus vel subfasciculatim ramosis ramisque erectis, compressiusculis, farctis, glaucis; vaginis laxiuscule convolutis, marcidis, demum deciduis; vaginis culmorum sterilium folia linearia gerentibus; spiculis masculis 00, in paniculam cymosam densam oblongam, spathis apertis vaginiformibus interstinctam, aggregatis; bracteis lanceolatis; glumis ovatis, acutis; antheris apiculatis, inclusis: spiculis femineis 3–4-floris; bracteis ovatis cuspidatis; glumis oblongo-acutis; stigmatibus 3 (2?).—Restio thyrsifer (*quoad femineam*), *Rottb. Descr. et Ic.* p. 8. n. 9, t. 3. f. 4, *nec Persoon.*—Elegia juncea, *Linn. ut supra; Kunth, Enum.* iii. p. 464, *excl. syn.*; *Steud. Syn.* ii. p. 261.—Restio Elegia, *Linn. Syst. Veg.* ed. xiv. p. 882.—Restio membranaceus, *quoad masculam, Nees ab Esenb. Linnæa*, v. p. 657.—Restio intermedius, *Steudel, Flora*, 1829, i. 132.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Ecklon*, Table Mountain, 836! (*pro parte*); *Burchell*, 564!, 6993!, 7435!, 7105!; *Drège*, 104!

♀, *Thunberg, in herb. Sonder. et. in herb. Linn.*!

♂ et ♀, *Ecklon*, 84!; Constantia, *Eckl.* 499!

Culmi fertiles cæspitosi, erecti, 18–24-poll., basi vaginis arctis coriaceis ellipticis acutis subulato-mucronatis, superne sensim longioribus vestiti, superne remote vaginati, simplices vel subfasciculatim ramosi, ramique erecti, compressiusculi, glauci, impresso-punctulati, plus minus tuberculati. *Vaginæ culmeæ* laxiuscule convolutæ, bipollicares, ellipticæ, coriaceæ, glaucæ, impresso punctulatæ, superne tenuiores, marcidæ, demum deciduæ. *Culmi* steriles conformes, duplo triplove breviores, ramosissimi, ramis subfasciculatis. *Vaginæ rameæ* ellipticæ, coriaceæ, persistentes, apice in folium lineare longiusculum productæ. *Panicula* mascula terminalis, erecta, oblonga, pluristachya, 1–2-poll. longa, spathis magnis apertis intus nitidis interstincta. *Spiculæ* breviter pedicellatæ, late ovatæ. *Bracteæ* lanceolatæ, acuminatæ, flores triquetros 2–3-plo superantes. *Glumæ externæ* 3, subæquales, ovatæ, acutæ, cymbiformes; *glumæ internæ* 3, oblongo-lanceolatæ, ferrugineæ, ad apicem albidæ, externis duplo longiores. *Antheræ* oblongæ, apiculatæ, flavidæ, inclusæ.—Stirpis femineæ *culmi vaginæ*que ut in mare. *Panicula* cymosa, oblonga, terminalis, 1–2 poll. longa. *Spathæ* pollicares, oblongo-ovatæ, acutæ, planiusculæ, coriaceæ, aureo-fuscæ, punctis nigris irroratæ, mox deciduæ. *Spathellæ* conformes, minores. *Ramuli* intra spathas gemini, inæquales, *longior* spatham æquans. *Spiculæ* 3–4-floræ. *Bracteæ* late ovatæ, cuspidatæ, glabræ, flores compressos vix superantes. *Perianthium* biseriale, sexglume, *glumis*

æqualibus, naviculari-oblongis, acutissimis, rigidis, *ovarium* trigonum velantibus. *Stigmata* 3, revoluta, villosa.

The authentic specimen in the herbarium of Linnæus, and the comparison of it with the plant named by Thunberg *E. juncea*, in Dr. Sonder's herbarium, and also with specimens to which Nees gave the name *E. membranacea*, leave no doubt as to the identity of *E. juncea*, concerning which so much confusion exists in books and in herbaria. This confusion seems to be attributable to Nees von Esenbeck, who under the head of *Restio junceus*, 'Linnæa,' v. p. 658, describes a plant received from Thunberg, in Willdenow's herbarium, but which, to quote Nees's own words, "sane per se quidem insufficiens maximeque imperfectum, non nisi culmi apicem vix quinque pollicum longitudine decerptum exhibens." Comparing this fragment with others that he thought belonged to the same species, but in support of which opinion he offers no evidence, he affirms *E. juncea*, Linn., to be different from *Restio thyrsifer*, Rottboell, even though Thunberg himself had recognized the identity of the two plants. Nees's words are, relating to Thunberg's imperfect specimen, "quod tamen cum aliis speciebus perfectioribus collatum, diversam esse hanc speciem tum a reliquis omnibus, quæ ad hæc tempora innotuere, tum maxime a *Restione thyrsifero* Rottboellii, a Thunbergio ad *Elegiam* suam citato, probat."

Judging from the description given by Nees, the "species perfectiores" to which he alludes belong to that now called *E. propinqua*.

Elegia juncea, as here understood, differs from *E. fistulosa*, Kunth, in its solid stems, and from *E. propinqua*, to which it is very closely allied, especially in the male plants, in its acute, not obtuse glumes. Rottböll describes his plant as having 2 styles; but little stress can be laid on this point, as the number of styles is variable even on the same plant, as I have found by experience.

5. E. PROPINQUA, *Kunth, Enum.* iii. p. 473; *Steud. Syn.* ii. p. 261.—Restio propinquus, *Nees ab Esenb. Linnæa*, v. p. 653.—Restio erectus, *Nees ab Esenb. Linnæa*, v. 655 (*excl. syn.*), *vix Thunb.*—Elegia thyrsifera, *Persoon, Syn.* ii. 607, *excl. syn.*—Restio thyrsifer, *Lam. Ill.* 803. f. 3, *nec Rottboell.*—E. Kraussii, *Hochstetter, Flora*, 1845, p. 340, *adnot.*

Var. equisetacea. Culmis ad vaginas subverticillatim ramulosis, ramulis erectis.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Burchell*, 168!, 574!, 8067!; Muisenberg, *Zeyher*, 4331!; *Dr. Thom*, 892!, 904!, 1032!; *Drège*, 103!, 367!, 1638!, 1647!

♀, *Sieber, herb. Cap.* 229!; *Burchell*, 8132!; Babyloonsche Toornberg, *Zeyher*, 4340!; Table Mountain, *McGillivray*, 432!; *Drège*, 2519!

♂ et ♀, *Burchell*, 6999!; *Harvey*, 389!; Simonstadt, *Eckl.* 1002!; *Eckl. et Zeyh.* 56. 5!

Var. equisetacea, ♂, *Drège*, 1644!

♀, *Burchell*, 7429.

♂ et ♀, *Eck. et Zeyh.*!

The female plant of this species is doubtless that which is figured by Lamarck, *l. c.*, as *Restio thyrsifer*, but which differs from Rottböll's plant of the same name, which is the *E. juncea* of Linn. The name *thyrsifera* is here suppressed, from the great confusion attaching to it.

Under the head of *Restio erectus*, Nees refers to Rottböll's plant, which he describes by some error as "planta mascula, inflorescentia incompleta, nondum adulta spathisque communibus adhuc obtecta." It is obvious that there is some confusion here, as the plant figured by Rottböll is a female. *E. propinqua*, as here understood, differs from *E. juncea* in its obtuse, not pointed glumes, and from *E. fistulosa* in its solid, not fistular culms, and in other particulars.

Judging from the description, this appears to be the plant the male of which is spoken of provisionally by Hochstetter, *loc. cit.*, as *E. Kraussii*.

6. E. FISTULOSA, *Kunth, Enum.* iii. p. 467; *Steud. Synops.* ii. p. 261.—Restio propinquus, *Nees pro parte in herb. Sonder.*—Restio erectus, *Nees in herb. Sonder., an Thunb.?*

Hab. Pr. B. Sp. Ex. sp. s. ♂, Cape Flats, *Ecklon*, 853!; *Drège*, 1638!

♀, *Mundt*!; *Drège*, 117!

♂ et ♀, *Eckl. et Zeyh.*

Planta feminea a cl. Kunthio tantum descripta. *Panicula mascula* cymosa, oblonga, compacta, ramosissima (2–6 poll. longa). *Spathæ* basi convolutæ, superne apertæ, lanceolatæ, mucronatæ, coriaceæ, fuscæ, extus impresso punctulatæ, intus nitentes. *Spathellæ* conformes, minores (pollicares), cuspidatæ, dorso exasperatæ nervoque medio prominente notatæ. *Bracteæ* fertiles late ovatæ, concavæ, mucronatæ, membranaceæ, subferrugineæ, carinatæ, glabræ, floribus vix dimidio breviores. *Flores* trigoni, 1–1½ lin. longi. *Glumæ externæ* 3, inter se æquales, late oblongæ, obtusæ, carinatæ, ferrugineæ, punctulatæ. *Glumæ internæ* 3, conformes, externis duplo longiores. *Antheræ* inclusæ. *Pistilli rudimentum* minutum.

Distinguished from *E. propinqua* mainly by the fistular stem, lanceolate spathes, and sharply triangular ovary.

7. E. PARVIFLORA, *Kunth, Enum.* iii. p. 467; *Steud. Synops.* ii. p. 262. —Restio parviflorus, *Thunb. Diss.* p. 13. n. 9.

Hab. Pr. B. Sp. [Ex. sp. s. ♂, *Robertson*!; *Masson*!; *Burchell*, nn. 822!, 7141!, 7710!, 8066! et 8127!; *Drège*, nn. 110!, 118!, 120!, 121!, 126!, 1639!, 1646!, 1649, 9455!; *Eckl. et Zeyh.* 51. 7!, 1. 11!, 56. 5!; *Ecklon*, in planitie Capensi, 457 b!, 557!, 749!, 952!, 973!; *Zeyher*, 1739!

♀, *Burchell*, nn. 353!, 7959!, 8121!, 8647!; *Zeyher*, 1004! (*vaginis sanguineis*); *Ecklon*, 794!; *Ecklon et Zeyher*, 56. 5!; *Drège*, 115!, 118!, 1639!

Apparently the most common, and most widely distributed of all the Restiaceæ, and hence subject to variation in the stature, degree of branching, number of flowers, size and persistence of sheaths, &c.

8. E. ASPERIFLORA, *Kunth, Enum.* iii. p. 474; *Steud. Synops.* ii. p. 262. —E. Dregeana, *Kunth, l. c.* p. 469.—Restio asperiflorus, *Nees ab Esenb. Linnæa*, v. p. 656.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Burchell*, 7179!, 8140!; *Drège*, 2520!, *pro parte*, 106!

♂, *Eck. et Zeyh.* i. 11!; *Drège*, 102!, 107!, 2518!; *Burchell*, 3996!

♀, *Burchell*, 8057!; *Drège*, 1640!; *Harvey*, 200!; *Dr. Thom*!

9. E. VERTICILLARIS, *Kunth, Enum.* iii. p. 471; *Steud. Synops.* ii. p. 262.—Restio verticillaris, *Linn. Suppl.* 425; *Thunb. Diss.* p. 19. n. 22, f. 7; *N. ab E. Linnæa*, v. p. 661.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Masson*!, *Dr. Mackrell*!, *Mundt*!; Olifantsrivier, *Eckl.*!, *Harvey*!; Gnadenthal, *Breutel*!

♀, *Eckl. et Zeyh.* 1. 12!; *Zeyher*, 81!; *Drège*, 1609!; *Burchell*, 4845!, 6992!; *Ludwig*!

♂ et ♂, *Zeyher*, 4344!

There is a fragment of this species in the Linnean herbarium, without spikelets, with the name "*Restio verticillaris*" attached to it.

10. E.? SQUAMOSA.—**Culmis teretibus v. compressiusculis, cinerascentibus, simplicibus vel dichotome ramulosis; vaginis laxiusculis, mucronatis, recurvatis, demum deciduis; floribus masculis congesto-paniculatis, spathis vaginiformibus, demum deciduis, interstinctis; bracteis ovatis, acutis, subulato-mucronatis; glumis ovatis, acutis, externis brevioribus: floribus femineis paucis, congestis; spathis cuspidatis; bracteis oblongo-acutis, floribus brevioribus; glumis oblongo-acutis, mucronatis, glumis internis longioribus; fructu oblongo, obtuso, biloculari, 2-spermo, indehiscente, stylis 2 vel 3 coronato.—An huc *Restio squamosus*, Thunb. Fl. Cap. i. 87?**

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Dr. Pappe*, 105!; *Burchell*, 7141!; *Drège*, 1648!; Uitenhage, *Eckl.* 795!; *Eckl. et Zeyh.* 78. 8!

♀, *Drège*, 111!, 2519.

Rhizoma repens, sublignosum, crassitie fili emporetici, vaginis approximatis dense obsitum. *Culmi* decumbentes, 8–12-pollicares, crassitie pennæ gallinaceæ et infra, subspongiosi, viridi-cinerascentes, purpureo maculati, dichotome ramosi, ramis erectis. *Vaginæ culmeæ* semipollicares, laxe convolutæ, membranaceæ, sub apice obtusiusculo mucronatæ, intus nitentes, sæpissime arcuatæ, recurvatæ, demum deciduæ, annulum nigrum relinquentes. *Vaginæ ramulorum* 4–5 lin. longæ, ellipticæ, obtusæ, laxe convolutæ, coriaceæ, ad margines tenuiores, sub apice membranaceo valide subulato-mucronatæ. *Flores masculi* 00, subtrigoni, in paniculam erectam, cymosam, oblongam, 2–3-pollicarem, spathis vaginiformibus, apertis, demum deciduis, interstinctam, congesti. *Bracteæ* undique arcte imbricatæ, late ovatæ, acutæ, concavæ, coriaceæ, ferrugineæ, sub apice pallidiore membranaceo subulato-mucronulatæ, flores vix superantes vel eis breviores. *Glumæ externæ* ovatæ, acutæ, coriaceæ, ferrugineæ, punctulis parvis exasperatæ, omnes magis minusve concavæ. *Glumæ internæ* 3, oblongæ, acutæ, ferrugineæ, puncticulatæ, externis duplo longiores. *Antheræ* inclusæ, oblongæ, apiculatæ. —Plantæ femineæ *culmi vaginæque* ut in mare. *Flores* congesto-paniculati, *spathis* apertis cuspidatis demum deciduis interstincti. *Bracteæ* oblongæ, acuminatæ, floribus breviores. *Glumæ externæ* oblongæ, acutæ, mucronatæ, 1-nerviæ, inter se æquales, internis juventute breviores, postea eas æquantes. *Glumæ internæ* oblongæ, externis vix longiores. *Ovarium* stipitulatum, turbinatum, coriaceum, biloculare, *stylis* 2 vel 3 superatum. *Stigmata* linearia, inclusa. *Fructus* indehiscens, oblongus, coriaceus, bilocularis, loculis 1-spermis.

Species mihi non satis nota, fructu indehiscente biloculari admodum singularis.

The specimens that I have examined of this species have been imperfect, so that I am not perfectly confident that the sexes are rightly matched. The peculiar conformation of the ovary and fruit is unmatched in the whole order; that it is really two-celled and indehiscent I have no doubt, from having examined several flowers; but in the absence of more complete evidence I prefer to place the species under *Elegia*, to which it conforms in habit &c., rather than to place it in a new genus. The variable length of the outer glumes in the male plant is not a point of much consequence, as the size of these parts is variable in other species according to age &c.

11. E.? GRANDIS.

Char. emend.—Culmis impresso punctulatis, aureo nitentibus, medio dichotome ramosis; vaginis culmeis 1–2-pollicaribus, laxiusculis, demum laxe patentibus, coriaceis, sub apice tenuiore valide subulato-mucronatis; floribus masculis plurimis, in cymas paniculatas pluriramosas dispositis; spathis magnis, apertis, nitentibus, demum

deciduis; glumis externis parvis, glumis internis oblongis acutis spiculis femineis 2-floris, in cymam linearem dispositis, spathis magnis munitis; glumis 6, subæqualibus, persistentibus; fructu oblongo, compressiusculo, 1-loculari; stigmatibus 2.—An vere hujus generis?—Restio grandis, *Spr. ined. fide N. ab E. Linnæa*, v. p. 660. —Elegia grandis, *Kunth, Enum.* iii. p. 475; *Steud. Synops.* ii. p. 262.

Hab. Pr. B. Sp. Ex. sp. sic. ♂ et ♀, Gnadenthal, *Ecklon*, n. 34!; *Zeyher*, 4337! ♀, *Drège*, 1650!

Culmi bi- tripedales, erecti, teretes v. compressiusculi, fistulosi, crassitie pennæ anserinæ, medio dichotome ramosi, rami erecti, impresso punctulati, pulchre aureo nitentes. *Vaginæ culmeæ* laxe convolutæ, demum patentes, 1–2-pollicares, ellipticæ, coriaceæ, extus impresso punctulatæ, aureo nitentes, intus planæ, nitidæ, sub apice tenuiore obtusiusculo subulato-mucronatæ. *Flores masculi* numerosissimi, in cymam pluriramosam, terminalem, *spathis* magnis, apertis, vaginiformibus, demum deciduis munitam dispositi, singuli pedicellati, *bractea* parva lineari suffulti, compressi, circiter 2 lin. longi. *Perianthium* biseriale, 6-glume, bracteam paulo superans. *Glumæ externæ* 3, inter se æquales, minutæ, lineares, rigidiusculæ, nervo medio notatæ. *Glumæ internæ* 3, inter se æquales, membranaceæ, ferrugineæ, oblongo-lanceolatæ, concavæ, externas duplo superantes. *Filamenta* plana, albida. *Antheræ* inclusæ, oblongæ, obtusiusculæ, rima longitudinali dehiscentes.—*Spiculæ femineæ* 5–6, in cymam linearem vel oblongam, distichem dispositæ, singulæ biflorae, *spatha* clausa vaginiformi suffultæ. *Flores* extus convexi, intus concavi, 2–3 lin. longi, breviter pedicellati, *bractea* minuta filiformi suffulti. *Perianthium* biseriale, 6-glume, *glumis* fusco-olivaceis, rigidis. *Glumæ externæ* inter se æquales, oblongo-obtusæ. *Glumæ internæ* paulo longiores, oblongo-spathulatæ, basi angustatæ. *Ovarium* ——. *Fructus* oblongus, compressiusculus, truncatus, sublignosus, 1-locularis, 1-spermus, perianthio persistente æquilongo cinctus, *stigmatibus* duobus triangularibus villosis superatus. *Semen* unicum, ex apice fructus pendulum.

A species remarkable for the brilliant golden or bronzy sheen of its epidermis. Its fruit differs from that of the other species of *Elegia*, and may possibly ultimately necessitate its removal into another genus.

12. E.? NEESII, sp. n. Culmis teretibus v. compressis, dichotome ramosis, ramisque erectis, scabriusculis, ferrugineis, subnitentibus; vaginis laxiusculis, scabriusculis, coriaceis, subulato-mucronatis; floribus masculis oblongis, obtusis, in cymam terminalem, pluriramosam dispositis; spathis vaginiformibus, demum deciduis; glumis externis linearibus v. subulatis, glumis internis oblongis v. subspathulatis: spiculis femineis 2-floris, in cymam lineari-oblongam, distichem,

pollicarem, spathis clausis 3–4 munitam dispositis; bracteis parvis; perianthio rigido; glumis internis paulo majoribus; fructu oblongo, compresso; stigmatibus 2.—Restio grandis, var. β, *N. ab E. Linnæa*, v. p. 661!

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Eckl.* 85!; *Burchell*, 569!
♀, in planitie Capensi, *Ecklon*, 560 b!

Culmi 18-pollicares, crassitie pennæ gallinaceæ, basi decumbentes, teretes, v. fistulosi, versus basim dichotome ramosi, ramique erecti, compressiusculi, brunnei, tuberculis majusculis (præsertim in pl. masc.) scabriusculi. *Vaginæ culmeæ* 1–2-pollicares, laxiuscule convolutæ, coriaceæ, fuscæ, scabriusculæ, sub apice tenuiore membranaceo concolori subulato-mucronatæ. *Flores masculi* numerosi, in cymam pluriramosam, *spathis* apertis scabriusculis magnis vaginiformibus interstinctam, dispositi, singuli pedicellati, oblongi, ovati, compressi, 1–1½ lin. longi, *bractea* parva lineari suffulti. *Glumæ externæ* 3, subulato-lineares. *Glumæ internæ* 3, oblongæ v. subspathulatæ, ferrugineæ, membranaceæ, glumas externas 2-plo superantes. *Antheræ* oblongæ. —Planta feminea masculæ conformis, nisi statura paulo graciliore epidermideque breviore.—*Spiculæ femineæ* 2-floræ, in cymam spiciformem linearem pollicarem dispositæ, singulæ *spatha* clausa vaginiformi ipsam duplo superante suffultæ. *Flores* breviter pedicellati, extus convexi, intus concavi, bracteaque parva lineari muniti. *Perianthium* biseriale, 6-glume. *Glumæ externæ* rigidæ, oblongæ, concavæ, sub apice mucronulatæ. *Glumæ internæ* latiores, laterales duæ conduplicatæ, basi angustatæ, postica planiuscula. *Ovarium* ——. *Fructus* indehiscens, oblongus, compressiusculus, rigidiusculus, truncatus, superne ad angulos *stigmatibus* 2 persistentibus, triangularibus, villosis superatus, 1-locularis, 1-spermus, perianthio persistente cinctus. *Semen* ex apice loculi pendulum.

This, like the preceding, is referred to *Elegia* provisionally. It is remarkable for its rugose, rich-brown, shining stems.

Species exclusæ.

ELEGIA RACEMOSA, *Pers.* = Dovea tectorum, *Mast.*

E. THYRSIFERA, *Pers.* = E. propinqua, *Kunth.*

E. PANICOIDES, *Kunth* = Dovea mucronata, *Mast.*

E. MEMBRANACEA, *Nees* = E. juncea, *Linn.*

ASKIDIOSPERMA, *Steudel, Synops. Glumac.* ii. p. 257.

1. A. CAPITATUM, *Steud. l. c.*

Hab. Pr. B. Sp. Ex. sp. s. ♀, *Drège*, 2510!

This singular plant has the dehiscent fruit of a *Dovea* or a *Restio*; but its appearance is not like either. In the deciduous

sheaths it approaches more nearly to the former than to the latter; but, on the other hand, the spikelets are many-flowered.

An huc planta mascula cujus notas adjicio, a *Drègio* (n. 1651) et *Burchellio* (n. 8719) lecta?

Culmi erecti, teretes, simplices, crassitie pennæ gallinaceæ, fusci, impresso punctulati. *Vaginæ culmeæ* deciduæ, basi annulum nigrum relinquentes. *Panicula* mascula terminalis, oblonga, erecta, pluriramosa, pluristachya, *spathis spathellis*que munita, *illis* apertis, ellipticis, coriaceis, pollicaribus, demum deciduis, interstincta. *Spathellæ* oblongæ, cuspidatæ, margine lacerato-fimbriatæ. *Bracteæ* lineari-ligulatæ, hyalinæ, integræ vel laceræ, *flores* trigonos stipitulatos 2–3-plo superantes. *Perianthium* biseriale, 6-glume. *Glumæ externæ* 3, inter se æquales, ovato-oblongæ, cuspidatæ, concavæ, glabræ, uninerviæ. *Glumæ internæ* 3, externis duplo longiores, oblongo-acutæ, rigidæ, fuscæ. *Antheræ* inclusæ, apiculatæ, intus secundum longitudinem dehiscentes.

DOVEA, *Kunth, Enum.* iii. p. 457 (1841); *Steud. Synops.* ii. p. 248.

CHAR. EMEND.—Flores dioici, fasciculato- vel spicato-congesti, singuli magis minusve triangulares, præsertim feminei, sessiles, bractea breviore stipati. Perianthium biseriale, sexglume. Glumæ exteriores breviores, ex his laterales naviculari-carinatæ. Glumæ internæ oblongæ, cymbiformes. Masc.:—Stamina 3, distincta. Antheræ uniloculares, dorso supra basim affixæ, antice secundum longitudinem dehiscentes. Pistilli rudimentum trilobum vel nullum. Femina:—Staminodia liguliformia vel nulla. Ovarium 3-lobum, 3-loculare. Stigmata 3, sessilia, intus villosa, revoluta. Capsula trilobata, trilocularis, vestigio stigmatum coronata, coriacea, dura, angulis salientibus longitudinaliter dehiscens. Semen in quovis loculo solitarium, pendulum, oblongum, testa membranacea longitudinaliter undulato plicata.—Rhizoma repens, squamatum. Culmi simplices vel virgato-ramosissimi, remote vaginati. Vaginæ deciduæ, basi annulari persistente. Inflorescentia mascula *Elegiæ* omnino conformis. Flores feminei in apice culmi vel ramorum (3–6) subspicatim dispositi, brevissime pedunculati vel sessiles, remotiusculi, singuli bractea (vagina florali Kunthii) majore aperta suffulti.—Fructu capsulari ab *Elegia*, inflorescentia mascula vaginisque deciduis a *Restione* discrepat.

1. D. MICROCARPA, *Kunth, Enum.* iii. p. 459; *Steud. Synops.* ii. p. 248. *Hab.* Pr. B. Sp. Species mihi ignota. Planta immatura, feminea, a cl.

Kunthio descripta, quo dicente variat stigmatibus 2 fructibusque dicoccis. An huc *Elegia ? squamosa*, mihi?

2. D. TECTORUM.—Restio tectorum, *Linn. Suppl.* 425, *fide spec. authent. in herb. Linn.*—Elegia racemosa, *Pers. Synops.* ii. 607; *Kunth, En.* iii. p. 463.—Restio racemosus, *Lam. Ill.* t. 804. f. 4?—Restio nudus, var. *α*, *Nees ab Esenb. Linnæa*, v. 651 (*excl. synon.*).—Restio nudus, var. *β*, *Nees, l. c. excl. syn.*

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Bergius*!; *Burchell*, 824!; in planitie Capensi, *Ecklon*, 559!; *Drège*, 124!

♀, *Burchell*, 824!; *Drège*, 2506!; False Bay, *Robertson*!; *Eckl. et Zeyh.* 60. 5!; "T. 508," *in herb. Linn.*!"

♀ et ♂. Specimina in herb. Linn. verisimiliter a Thunbergio lecta!; Cape Flats, *Ecklon*, 865!

According to the specimens in the Linnean herbarium, there is no doubt as to the plant Linné intended to be called *Restio tectorum*. This corresponds much better, in general appearance, with what Persoon and others have called *Elegia racemosa*, than do *E. deusta* or *E. nuda*, to one or other of which Linné's *R. tectorum* has been referred. A manuscript note attached to the Linnean specimens says, "eo tecta conficiuntur ad Cap. B. Sp."

It differs from *E. nuda* (which otherwise it much resembles) in the size of its flowers and specially in its obtuse, not pointed glumes. From *E. deusta* it differs in the sheaths; from both it differs in the three-celled, three-lobed fruit. Lamarck's figure of *Restio racemosus* shows a dehiscent fruit, and the glumes are acutely pointed; so that I can only refer his plant to the present species with considerable doubt.

3. D. HOOKERIANA, sp. n. Culmis simplicibus, filiformibus; panicula mascula oblonga, pluristachya, spathis deciduis interstincta; bracteis suborbicularibus, acuminatis, flores vix æquantibus; pistilli rudimento 3-stylo: plantæ femineæ bracteis ovatis, mucronatis; glumis oblongo-acutis, mucronatis; fructu capsulari, staminodiis 3 longiore, stigmatumque vestigiis coronato.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Burchell*, 8007!, 7568!; *Dr. Thom*, 1021!, 901!

♀, *Zeyher*, 4335!; *Dr. Thom*, 632!

♂ et ♀, *Burchell*, 8062!; *Ecklon et Zeyher*, 56. 6!; Hottentotshollandberg, *Eckl.* 960!

Culmi cæspitosi, erecti, 2–3-pedales, crassitie pennæ corvinæ, simplices vel parce dichotome ramosi, rigidi, teretes vel compressiusculi, farcti, cinerei, impresso punctulati, maculis purpureis muniti, basi vaginis parvis spadiceis approximatis vestiti, superne remote vaginati. *Vaginæ* arctæ, ellipticæ, coriaceæ, fuscæ, nervoso-striatæ, 5–7 lin. longæ,

sub apice membranaceo mucronato-aristatæ, demum deciduæ, basi annulari nigra persistente. *Panicula mascula* cymosa, pluristachya, conferta, oblonga, erecta, terminalis, 2–3 poll. longa, *spathis* deciduis interstincta. *Spiculæ* 1-floræ. *Bracteæ* parvæ, suborbiculares, acuminatæ, *flores* oblongos, trigonos (1–2 lin. longos), arcuatos vix æquantes. *Glumæ* rigidæ, ferrugineæ, *externæ* 3 æquales, cymbiformes, oblongæ, acutatæ; *glumæ internæ* oblongo-acutæ, externis duplo longiores. *Stamina* inclusa. *Antheræ* apiculatæ. *Pistilli* 3-styli rudimentum.—Plantæ femineæ *culmus vaginæque* omnino ut in mare. *Flores* feminei rotundati, magnitudine pisi parvi, in apice culmi in cymam linearem spiciformem dispositi, sessiles vel pedicellati. *Pedicelli* complanati, singuli *spatha* aperta, vaginiformi, decidua donati. *Bracteæ* ovatæ, mucronatæ, coriaceæ, fuscæ, infimæ vacuæ, bractea fertilis flore oblongo brevior. *Glumæ* 6, subæquales, oblongæ, acutæ, cymbiformes, rigidæ. *Staminodia* 3, liguliformia. *Ovarium* ——. *Capsula* triloba, 3-locularis, angulis salientibus per longitudinem dehiscens, stylorum 3 vestigiis superata, perianthio persistente vix longiore suffulta.

4. D. MACROCARPA, *Kunth, Enum.* iii. p. 458; *Steud. Synops.* ii. p. 248. —Restio nudus, var. γ. pauciflorus, *Nees ab Esenb. Linnæa,* v. p. 651. —Restio (Elegia) fuscus, *Nees ab Esenb. MS. in herb. Sonder.*— Restio equisetaceus, *Reichenb. in herb.*

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Zeyher.* 1178!, 1740!; Cederberg, 76!; *Burchell,* 824! *pro parte*; *Drège,* 2507!

♀, *Drège,* 2523!

Stirpis masculæ, hactenus indescriptæ, *culmus vaginæque* ut in feminea. *Panicula* mascula terminalis, oblonga, erecta, pluristachya, 3–4 poll. longa. *Spiculæ* subrotundæ, plurifloræ, 1–2 lin. longæ, spathis deciduis interstinctæ? *Bracteæ* arcte imbricatæ, late ovatæ, coriaceæ, ferrugineæ, ad margines membranaceæ. *Flores* compressiusculi, v. subtrigoni, 1–2 lin. longi, bracteas duplo superantes. *Glumæ externæ laterales* oblongæ, obtusæ, cymbiformes, coriaceæ, ferrugineæ, ad margines membranaceæ, *intermedia* planiuscula. *Glumæ internæ* 3, inter se æquales, externis duplo longiores, oblongæ, concavæ. *Antheræ* inclusæ, oblongæ, apiculatæ, ferrugineæ, filamentis vix breviores, *Pistilli rudimentum* parvum vel nullum.

The seeds of this and other species of *Dovea* have an outer covering, at first adhering to the brown investment of the seed, giving it the appearance of having longitudinal white striations; but as the seed gets older the outer covering becomes detached, and then resembles an arillus covering nearly the whole seed, and divided into a number of laciniæ or whitish ribbon-like segments.

5. D. EBRACTEATA, *Kunth, Enum.* iii. p. 458; *Steud. Synops.* ii. p. 248. *Hab.* Pr. B. Sp. Ex. sp. s. ♂, *Burchell,* 524!, 567!; *Drège,* 124!

♀, *Burchell*, 526!; Lowenberg, *Ecklon*, 837!; *Drège*, 124!, 125!; *Sieber, Fl. Cap.* 232, *sub nom.* R. equisetacei!; *Milne*, 236!, 438!
♂ *et* ♀, *Burchell*, 524!

Plantæ masculæ, hucusque indescriptæ, *culmus vaginæque* ut in feminea. *Panicula* terminalis, compacta, oblonga, pluristachya, 1–2 poll. longa. *Spiculæ* oblongæ, plerumque 1-floræ. *Bracteæ* arcte imbricatæ, ovatæ, mucronatæ, rigidæ, ferrugineæ. *Bractea* fertilis *flore* subtrigono, 1–1½ lin. longo, dimidio brevior. *Glumæ externæ* rigidæ, oblongo-acutæ, concavæ. *Glumæ internæ* oblongæ, externis dimidio longiores. *Antheræ* inclusæ, oblongæ, apiculatæ, filamentis vix breviores. *Pistilli* rudimentum minutum vel nullum.

One of Ecklon's specimens collected at Gnadenthal, but to which no number is attached, is apparently a robust form of this species with a more branched cyme and slightly larger flowers.

6. D. THYRSOIDEA, sp. n. Culmis teretibus vel (siccitate?) subtetragonis; panicula mascula cymosa, oblonga; spathis deciduis; bracteis ovatis, concavis, flores oblongos vix æquantibus; glumis externis oblongis, acutis; glumis internis longioribus, oblongis, obtusis: panicula feminea spathis convolutis magnis demum deciduis munita; glumis rigidis, mucronatis; ovario 3-lobo, 3-loculari; fructu capsulari.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Burchell*, 5895!

Culmi erecti, simplices, juncei (3–4-ped?), teretes v. compressiusculi, crassitie pennæ olorinæ, impresso punctulati, cinerei. *Vaginæ culmeæ* laxe tubulosæ, coriaceæ, ellipticæ, fuscæ, impresso punctulatæ, tuberculis parvis dense obsitæ, demum deciduæ. *Panicula* mascula cymosa, densa, oblonga, erecta, 2–3 poll. longa, *pedicelli*, in axillis spatharum deciduarum vaginiformium, gemini inæquales. *Bracteæ* late ovatæ, concavæ, spadiceæ, flores oblongos vix æquantes. *Glumæ externæ* oblongo-acutæ, cymbiformes, spadiceæ, rigidiusculæ. *Glumæ internæ* oblongæ, obtusiusculæ, externis duplo longiores. *Stamina* inclusa. *Antheræ* apiculatæ.—Plantæ femineæ *culmus vaginæque* ut in mare. *Panicula* erecta, lineari-oblonga, 5–6 poll. longa, *spathis* magnis convolutis vaginiformibus diu persistentibus (demum deciduis?) munita. *Pedicelli* intra spathas reconditi. *Glumæ* juveniles ut in flore masculo. *Ovarium* 3-lobum, 3-loculare, *stigmatibus* 3, intus villosis, revolutis superatum. *Perianthium* fructiferum rigidum, accrescens, glumis mucronatis. *Capsula* 3-loba, 3-locularis, angulis salientibus dehiscens, perianthio vix brevior. *Semen* in quovis loculo solitarium, oblongum, testa undulato plicata.

7. D. MUCRONATA.—Restio mucronatus, *Nees ab Esenb. Linnæa*, v. p. 660.—Elegia mucronata, *Reich.* ex *Kunth, Enum.* iii. p. 475; *Steud.* ii. p. 262.—Elegia panicoides, *Kunth, Enum.* iii. p. 470 (quoad pl. masc.); *Steud. Synops.* ii. p. 262.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Masson*!; *Drège*, 34!
♂, ♀, *Burchell*, 563!, 7026!

Plantæ femineæ nimis imperfecte descriptæ characteres adjicio.

Culmus vaginæque ut in mare. *Panicula* terminalis, oblonga, 2–3 poll. longa, pluristachya, *spathis* magnis convolutis interstincta. *Spiculæ* 1-floræ. *Bracteæ* ovatæ, acuminatæ, coriaceæ, ferrugineæ, dorso medio nonnunquam villosæ. *Flores* subtrigoni, bracteas duplo triplove superantes. *Glumæ* rigidæ, ferrugineæ; *externæ* tres æquales, late ovatæ, subcymbiformes, carinatæ, glabræ, mucronatæ. *Glumæ internæ* conformes, ecarinatæ, externis paulo longiores latioresque, fructum vix superantes. *Capsula* coriacea, ferruginea, triloba, trilocularis, superne stylorum vestigiis superata, angulis salientibus longitudinaliter dehiscens. *Semen* in quovis loculo solitarium, pendulum, oblongum, subtrigonum, corneum. *Testa* (?) membranacea, laxa, longitudinaliter plicata, plicis undulatis.

This plant, remarkable for its thick culms and large inflorescence, is called, in some parts of the Cape, "Elephant-Reed." Its seeds are marked with white projecting wavy ridges (see *D. macrocarpa*). There is a specimen of the male plant in the Linnean herbarium.

HYPODISCUS, *Nees ab Esenbeck in Lindl. Nat. Syst.* ed. 2. p. 450 (1836); *Kunth, Enum.* iii. p. 481.

CHAR. EMEND.—Flores dioici; masculi spicati, singuli compressi, bractea stipati. Spicæ paucæ vel cymoso-paniculatæ. Perianthium biseriale, sexglume; glumæ inæquales, exteriores laterales carinatæ, apteræ. Stamina 3, distincta. Antheræ dorso infra medium affixæ, antice, secundum longitudinem, dehiscentes.—Spicæ femineæ solitariæ, vel paucæ in cymam linearem spiciformem dispositæ, pluribracteatæ, unifloræ. Flos terminalis, stipitatus vel sessilis. Perianthium hyalinum, sexglume, vel nullum. Ovarium stipitulatum, disco lobato sæpissime circumdatum, abortu 1-loculare. Stylus brevis, crassus, subcarnosus, in stigmata 2, elongata, interne plumoso-villosa divisus. Fructus osseus, 1-locularis, monospermus, indehiscens, lævis vel plerumque plus minus tuberculatus, stipitulatus, disco perigyno vel hypogyno circumdatus.—Rhizoma horizontale, repens, vaginis approximatis obtectum. Culmi simplices, remote vaginati. Vaginæ arctæ persistentes.—Leucoplœus, *Nees ab Esenb. in Lindl. Nat. Syst.* ed. 2. p. 450; *Kunth, Enum.* iii. p. 481.—Bœckhia, *Kunth, Enum.* iii. p. 449 (anno 1841).—Lepidanthus, *Nees ab Esenb. Linnæa*, v. p. 665.

* *Flores feminei stipiti carnoso impositi; fructus stipitulatus, lævis.*

1. H. ARISTATUS, *N. ab E. in Lindl. Nat. Syst. Bot.* ed. 2. p. 450 (nomen tantum). Culmis teretibus; vaginis ellipticis, nisi ad apicem arcte

convolutis, sub apice mucronatis; spiculis masculis nunc solitariis, nunc 3–5 approximatis spicatimque dispositis, oblongis v. sub-globosis; bracteis arcte imbricatis, oblongis, acuminato-aristatis, aristis patulis; spiculis femineis solitariis, v. raro 2–3 approximatis, 1-floris, masculis multo majoribus; glumis subæqualibus, lanceolatis, persistentibus, ad basim ovarii stipiti crasso adhærentibus; fructu oblongo, lævi.—Restio aristatus, *Thunb. Diss.* p. 10. n. 3. fig. 4 (mas.); *N. ab E. Linnæa*, v. p. 636; *Kunth, Enum.* iii. p. 383, *quoad pl. masc.*; *Steud. Synops.* ii. p. 249, *pl. masc.*

Var. *α*. bicolor. Vaginarum, spatharum bractearumque marginibus et aristis aureo-flavidis.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, Hottentotshollandberg et Groot-Houhoek, *Zeyher*, n. 4332!; *Burchell*, n. 6027!

♂, *Sieber, Fl. Cap.* 113!; *Eckl. et Zeyh.* 56. 6!; Table Mount, *Eckl.* 78!, 80!, 84!, 816!; *Dr. Thom*, n. 1032!; *Drège*, nn. 20!, 199 b!, 2513!; *Burchell*, nn. 7594!, 7963!; *Ludwig in herb. Field.* 1!; *Admiral Grey*!

♀, *Ecklon*, nn. 75!, 78!, 864!; *Burchell*, nn. 339!, 7057!; Simon's Town, *Wright*, 488!

Var. bicolor ♂ et ♀, Olifants-Rivier (Aprili), *Eckl. sine numero*!; *Eckl. et Zeyh.* nn. 56. 6!, 76. 4!

♂, *Burchell*, 7963!, 7954!

♀, *Drège*, 2509!

Culmi erecti, teretes, simplices, 1–3-pedales, olivacei, subtilissime puncticulati, crassitie pennæ gallinaceæ. *Vaginæ caudiceæ* approximatæ, oblongæ, obtusiusculæ, aristatæ, coriaceæ, nitidæ, sursum increscentes; *vaginæ culmeæ* 1–1½-pollicares, ellipticæ, nisi ad apices arcte convolutæ, coriaceæ, fuscæ, sub apice obtusiusculo flavido mucronato-aristatæ. *Spiculæ masculæ* solitariæ, geminæ vel 3–7 spicatim dispositæ, approximatæ, geminæ spatha suffultæ, altera breviter pedicellata, singulæ erectæ, oblongæ vel subglobosæ, 7–8 lin. longæ; *spathæ* apertæ, vaginiformes, sulcato-striatæ, spiculas subæquantes. *Bracteæ* arcte imbricatæ, oblongæ, coriaceæ, fuscæ vel castaneæ, longissime aristatæ, aristis patulis. *Flores* oblongi, arcuati, compressi, bracteis stipantibus breviores. *Perianthium* inæqualiter biseriale, sexglume. *Glumæ externæ* oblongo-lanceolatæ, laterales naviculari-conduplicatæ, villoso-carinatæ, *intermedia antica* planiuscula; *internæ* conformes, paullo minores. *Antheræ* lineari-oblongæ, apiculatæ. *Pistilli rudimentum* nullum.—Plantæ femineæ *culmus vaginæque* ut in mare. *Spiculæ* solitariæ v. approximatæ, 1-floræ, ovato-oblongæ, pollicares, *spatha* aperta vaginiformi suffultæ. *Bracteæ* arcte imbricatæ, ovato-lanceolatæ, acuminatæ, acuminibus erectis, coriaceæ, fuscæ, flavo marginatæ. *Flos* unicus terminalis. *Perianthium* biseriale, sexglume, stipiti carnoso, sexlobo impositum. *Glumæ* subæquales, membranaceæ, oblongo-lanceolatæ, persistentes. *Ovarium* . . . . . *Stylus* brevis. *Stigmata* 2-linearia, elongata. *Fructus*

oblongus, obtusus, lævis, indehiscens, osseus, nigrescens, breviter stipitatus, unilocularis, 1-spermus, perianthio persistente æquilongo cinctus.

Apparently one of the commonest and most widely distributed species of the order, and varying considerably in stature, number of spikelets, and coloration of the bracts, &c. In the var. *bicolor* the yellow colour, which is generally confined to the margins and extreme points of the sheaths, extends over half their surface.

Thunberg described both male and female plants; but his figure represents the former only. From the very meagre description given by that author of the female plant, and perhaps from its comparative rarity in herbaria, Kunth and other authors have been led into confusion.

Nees von Esenbeck said that the female plant could not be classed with the genus *Restio*, and placed it in his genus *Hypodiscus*; but, unfortunately, by mistake he wrote *Restio aristatus*, Linn., instead of Thunberg, and thus has added to the perplexity of subsequent authors. No such species as *Restio aristatus*, Linn., is known.

Nees, although he indicated the species, gave no description of it; hence I have drawn one up as above.

** *Perianthium sessile vel stipite carnoso destitutum. Fructus plus minus tuberculatus, sessilis vel stipitulatus.*

2. H. Oliverianus, sp. n. Culmis strictissimis, filiformibus, teretibus v. subcompressis, basi vaginis approximatis præditis, cæterum nudis; spiculis masculis 2–3, in apice culmi alternato-approximatis, raro solitariis, subglobosis v. turbinatis; bracteis arcte imbricatis, castaneis, oblongis, aristatis, aristis longissimis, flavidis, patentibus; floribus compressis, arcuatis; glumis 6, inæqualibus, lanceolatis, externis lateralibus duabus conduplicatis, carinatis, carinis glabris, intermedia planiuscula, internis conformibus; antheris apiculatis: spiculis femineis solitariis vel geminis, 1-floris, cylindraceo-lanceolatis; bracteis ut in mare; flore unico terminali; perianthio minuto, hyalino, biseriali 6-glumi, glumis subæqualibus ovatis; ovario stipiti crasso imposito, superne ad discum epigynum, crassum, profunde lobatum adhærente, uniloculari; stylo brevi; stigmatibus linearibus, longiusculis, exsertis.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Burchell*, n. 8118!

Culmi dense cæspitosi, erecti, teretes v. subcompressi, simplices, strictissimi, 3–4-pedales, crassitie pennæ passerinæ. *Vaginæ caudiceæ* approximatæ, arcte convolutæ, infimæ nitidæ, superiores duplo triplove majores, coriaceæ, cinnamomeo-fuscæ, albo maculatæ, obsolete striatæ, sub apice obtusiusculo flavido aristulatæ. *Vaginæ culmeæ* nullæ.

Spiculæ masculæ in apice culmi, 2–3, approximatæ, raro solitariæ, singulæ oblongæ vel turbinatæ, 3–4 lin. longæ, 2–3 lin. latæ, *spatha* aperta, vaginiformi, intus flavo nitente, spiculam æquante vel superante suffultæ. *Bracteæ* arcte imbricatæ, cartilagineæ, castaneæ, impresso punctulatæ, ad margines superne laceræ, superne in aristam terminalem, albidam, patulam, bractea ipsa longiorem desinentes. *Flores* arcuati, compressi, bracteis minores. *Perianthium* biseriale, sexglume, *glumis* inæqualibus, lanceolatis, *lateralibus externis* conduplicatis, carinatis, carinis glabris, *cæteris* planis, *internis* paulo brevioribus. *Antheræ* lineares, apiculatæ.—Plantæ femineæ *culmus vaginæque* ut in mare. *Spiculæ* in apice culmi, 2–3, 1-floræ, cylindraceo-lanceolatæ, masculis minores, *spathis* apertis flavidis suffultæ. *Bracteæ* oblongæ, castaneæ, longe aristatæ, aristis rectis v. tortis, flavis. *Perianthium* minutum, hyalinum, biseriale, sexglume, *glumis* subæqualibus, ovatis. *Ovarium* stipiti crasso impositum, oblongum, superne disco epigyno, lobato, lobis crassis clavatis, notatum, 1-loculare. *Stylus* brevis, crassus. *Stigmata* duo, linearia, intus villosa, exserta. *Ovulum* unicum, ex apice loculi pendulum. *Fructus* .....

Allied in some respects to *H. albo-aristatus*, this species may be distinguished by its larger spikes and by the very long spreading points to the bracts.

3. H. RUGOSUS, sp. n. Culmis compressiusculis, simplicibus; vaginis culmeis remotis, laxiusculis, tubulosis, coriaceis, striatis, sub apice mucronatis: spiculis femineis 2–3, approximatis, turbinatis; bracteis arcte imbricatis, oblongo-lanceolatis, acuminatis; flore unico; perianthio biseriali, sexglumi; glumis æqualibus, basi haud incrassatis; ovario brevissime stipitulato, oblongo, obtuso, tuberculis crassiusculis dense obsito, stylo brevi, stigmatibus duobus; fructu oblongo, tuberculato.

Hab. Pr. B. Sp. Ex. sp. s. ♀, Voormansbosch (Oct.), *Zeyher*, 4336!; *Ecklon et Zeyher*, 85! *Mas latet.*

Radices sublignosi, flexuosi, cortice crasso, cinereo, subspongioso vestiti. *Culmi* cæspitosi, erecti, pedales et ultra, simplices, compressiusculi, straminei, siccitate sulcati, tuberculis minimis albidis dense conspersi. *Vaginæ caudiceæ* approximatæ, ovatæ, acutæ, nitidæ, griseæ, cartilagineæ, sub apice mucronulatæ. *Vaginæ culmeæ* remotiusculæ, pollicares et ultra, laxiusculæ, tubulosæ, ellipticæ, coriaceæ, striatæ, sub apice membranaceo obtuso mucronato-aristatæ.—*Spiculæ femineæ* in apice culmi, 2–3, approximatæ, erectæ, obpyramidatæ, 5–6 lin. longæ, 1 lin. latæ, singulæ 1-floræ, *spatha* lanceolata, aristata, coriacea, purpureo maculata, spiculam æquante suffultæ. *Bracteæ* arcte imbricatæ, oblongo-lanceolatæ, acuminatæ, cartilagineæ, superne castaneæ, basi flavescentes. *Flos* unicus, terminalis, bractea stipante brevior. *Perianthium* stipite carnoso brevissimo, vel nullo, æqualiter et biseriale sexglume; *glumæ* oblongo-lanceolatæ, planiusculæ, hyalino-membranaceæ, ovarium æquantes. *Ovarium* brevissime stipitatum,

oblongum, obtusum, tuberculis crassiusculis munitum, 1-loculare, 1-ovulatum. *Stylus* brevis, superne in ramos duos elongatos exsertos intus stigmatosos divisus. *Fructus* perianthio persistente cinctus, osseus, indehiscens, ovato-oblongus, obtusus, medio tuberculis magnis, prominentibus, rufescentibus donatus, superne glabrescens, sed ad apicem, circa basin styli decidui, dentibus sex parvis munitus, unilocularis.

4. H. SYNCHROOLEPIS. Culmis simplicibus, filiformibus, erectis; vaginis culmeis tubulosis, nisi ad apices arcte convolutis; spiculis masculis 6–8, in cymam linearem approximato-alternis, subglobosis; bracteis arcte imbricatis, ovatis, aristatis; aristis erectis, pallidis; floribus arcuatis, compressis; glumis inæqualibus, rigidiusculis; spiculis femineis 3–6, in cymam linearem disticham approximatis, singulis cylindraceo-lanceolatis, 1-floris; perianthio parvo; glumis subæqualibus, ovatis, hyalinis; ovario oblongo, ad discum tubulosum, superne profunde lobatum, lobis clavatis, adhærente; stylo unico, basi in stylopodio subgloboso, crasso, lobato dilatato; stigmatibus 2 elongatis.—Restio synchroolepis, *Steudel, Synops.* ii. p. 250, *quoad plant. masc.*—?Hypodiscus duplicatus, *Hochstetter, Flora,* 1845, p. 338.

Hab. Pr. B. sp. Ex. sp. s. ♂ ♀, Uitenhage, *Zeyher*, 817!, et Stadesberg (Maio), n. 4334!

♀, *Burchell*, n. 4705!

Culmi cæspitosi, erecti, stricti, simplices, 2–3-pedales, crassitie pennæ passerinæ, olivacei, purpureo maculati. *Vaginæ caudiceæ* approximatæ, oblongæ, aristulatæ, nitidæ, sursum increscentes; *vaginæ culmeæ* pollicares et ultra, tubulosæ, nisi ad apices arcte convolutæ, coriaceæ, fuscæ, albo maculatæ, marginibus utrinque flavidis, sub apice obtuso flavo-aristulatæ, aristula ultra apicem haud exserta (vaginæ muticæ, *Steud.*). *Spiculæ* masculæ 6–8, in cymam linearem, disticham, erectam, terminalem, per paria approximatæ, altera sessilis, altera pedicellata, pedicello complanato, sursum dilatato, spicula vix breviore, singulæ pluriflorræ, ovato-oblongæ vel subglobosæ, 2–3 lin. longæ, 2–2½ lin. latæ, *spatha* aperta, vaginiformi, quam spicula ipsa breviore suffultæ. *Bracteæ* arcte imbricatæ, ovato-oblongæ, castaneæ, puncticulatæ, aristis longiusculis, albidis, erectis vel vix patentibus terminatæ. *Flores masculi* compressi, arcuati, oblongi, bracteas (aristis exceptis) æquantes. *Perianthium* biseriale, sexglume; *glumis* inæqualibus, oblongo-lanceolatis, rigidiusculis, *lateralibus externis* naviculari-conduplicatis carinatis, carinis glabris, *intermedia antica*, plana, *internis* planis, brevioribus, tenuioribus; *antheræ* lineari-oblongæ.—Plantæ femineæ *culmi, vaginæ, inflorescentia bracteæque* ut in mare. *Spiculæ* singulæ 1-floræ, cylindraceo-lanceolatæ, 2–3 lin. longæ, vix 1 lin. latæ. *Perianthium* minutum, biseriale, sexglume; *glumis* subæqualibus, hyalinis, ovatis, acutis. *Ovarium* oblongum, obtusum, glumas duplo triplove superans, superne lobis pluribus clavatis car-

nosis (disco adhærente?) notatum, uniloculare. *Ovulum* unicum, ex apice loculi pendulum. *Stylus* brevis, crassus, superne in ramos duos longos exsertos intus villosos, stigmatosos divisus, basi in stylopodio rotundato crasso lobato expansus. *Fructus* oblongus, durus, indehiscens, superne tuberculatus, styli vestigiis notatus, basi perianthio persistente cinctus. *Semen* . . . . . .

5. H. ALBO-ARISTATUS. Culmis teretibus, vel subcompressis; vaginis culmeis remotis, interdum nullis, arcte convolutis, sub apice flavido mucronatis; spiculis masculis 2–3, approximatis, oblongis vel subglobosis; bracteis oblongis, acuminatis, acuminibus albidis vel flavis; glumis lanceolatis; antheris apiculatis: spiculis femineis 2–3, approximatis, oblongis, 1-floris, spathis bracteisque ut in mare; glumis parvis, ovatis, acutis, hyalinis; ovario oblongo, breviter stipitato, superne ad discum crenulatum annulare adhærente; stylo brevi, stigmatibus 2, longiusculis, exsertis; fructu oblongo, basi perianthio parvo cincto.—Restio albo-aristatus, *N. ab E. Linnæa*, v. 635; *Kunth, Enum.* iii. p. 407; *Steud. Syn.* ii. p. 249, *quoad pl. masc.*—Hypodiscus duplicatus?, *Hochst. Flora*, 1845, p. 338.—Bœckhia lævigata, *Kunth, Enum.* iii. p. 450, *quoad femineam.*

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Masson*!; *Drège*, 16!, 199 a!; *Eckl.* 91!, 874!; *Zeyher*, 816!; *Dr. Thom*, 1060!

♀, *Eckl.* 818!; *Zeyher*, 972!; *Burchell*, 7655!; False Bay, *Robertson*!; Uitenhage, *Niven*!, *Drège*, 2478!

♂ et ♀, Hottentotshollandberg, *Zeyher*, 4333!

Culmi cæspitosi, erecti, simplices, teretes vel compressiusculi, 18–24-pollicares, crassitie pennæ corvinæ, olivacei, purpureo maculati, basi *vaginis* dense imbricatis, obtusiusculis, castaneis, nitidis vestiti. *Vaginæ culmeæ* 1 vel 2, interdum nullæ, sesquipollicares, tubulosæ, basi arcte convolutæ, versus apicem subpatentes, coriaceæ, fuscæ, flavido maculatæ, ad margines apicemque obtusiusculum flavidæ, mucronato-aristatæ, arista erecta, nonnunquam torta. *Spiculæ masculæ* 2–3, in apice culmi approximatæ, sessiles, *rachi* flexuosæ compressæ impositæ, singulæ plurifloræ, oblongæ vel subglobosæ, 3–4 lin. longæ, 2–3 lin. latæ. *Spathæ* apertæ, vaginiformes, inferior spicula sua longior, reliquæ spiculis paulo longiores seu easdem æquantes. *Bracteæ* arcte imbricatæ, cartilagineæ, oblongo-ovatæ, fuscæ, longiuscule cuspidato-aristatæ, ad margines aristasque flavidæ vel albidæ. *Perianthium* compressum, arcuatum, rigidiusculum, inæqualiter biseriale, 6-glume, *glumis* oblongo-lanceolatis, *lateralibus externis*, conduplicatis, glabris, *intermedia antica* glabra, *internis* conformibus, paullo minoribus, tenuioribus. *Antheræ* lineari-oblongæ, apiculatæ.—Plantæ femineæ *culmi, vaginæ, inflorescentia* plerumque ut in mare. *Spiculæ* unifloræ, cylindraceo-lanceolatæ, 3–4 lin. longæ, 1–1½ lin. latæ. *Bracteæ* oblongo-lanceolatæ, cuspidatæ, castaneæ, marginibus cuspidibusque albidis. *Perianthium* stipitatum (stipite brevi, crasso), minutum, hyalinum, biseriale, 6-glume, *glumis* æqualibus ovatis. *Ovarium* oblongum,

stipiti cylindraceo impositum, *disco* epigyno annulari crenulato superatum, uniloculare. *Stylus* brevis. *Stigmata* 2, longa, exserta, intus villosa. *Ovulum* unicum, ex apice loculi pendulum. *Fructus* ......

6. H. STRIATUS. Boeckhia striata, *Kunth, Enum.* iii. p. 449; *Steud. Synops.* ii. p. 263.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Drège,* 2484 c!, 2022!, 2479!; *Eckl.*!

♀, *Drège,* 2480!, 2484!, 9452!; *Eckl. et Zeyh.* 105. 3!

♂ et ♀, *Drège,* 2488 b b!, 2484!; Ylandsrivier (*Martio*), *Zeyher*!

In some of Ecklon's specimens the male plants have branched or compounded inflorescences, and the flowers themselves are altered by the production of an increased number of glumes, some of which show transitional forms between ordinary glumes and stamens.

7. H. BINATUS. Culmis erectis, fistulosis, simplicibus; vaginis culmeis arcte convolutis, coriaceis, striatis, sub apice pallidiore subulato-mucronatis; spiculis masculis subglobosis, in paniculam erectam linearem laxiusculam geminatim ternatimve dispositis; bracteis late ovatis, acutis, dorso sub apice vix carinatis: spiculis femineis cylindraceo-lanceolatis; perianthio minuto, hyalino; ovario disco epigyno carunculato flavido notato; stylo unico, crasso.—Dovea binata, *Steud. Syn.* ii. p. 248, *femina tantum.*

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Burchell,* n. 7958!; ♀, *Drège,* n. 2477!

Culmi bipedales et ultra, ad basim cæspitosi, *squamis* ovatis vel oblongis coriaceis castaneis nitidis mucronatis dense approximatis vestiti, superne erecti, teretes vel compressiusculi, fistulosi, simplices, crassitie pennæ corvinæ, olivacei, purpureo maculati, remote vaginati; *vaginæ culmeæ* 1–2-pollicares, arcte convolutæ, fuscæ vel cinnamomeæ, coriaceæ, purpureo maculatæ, sub apice tenuiore flavido subulato-mucronatæ. *Cymulæ* 4–6, remotiusculæ, in paniculam erectam terminalem distiche dispositæ, singulæ *spatha* oblonga aperta sulcato-striata vaginiformi, cymula breviore, suffultæ. *Spiculæ* masculæ in singulis cymulis geminatim vel ternatim dispositæ, altera sessilis, altera pedicellata, pedicello complanato, sursum dilatato, spiculam æquante, singulæ subglobosæ, 3–4 lin. longæ, 3–3½ lin. latæ. *Bracteæ* arcte imbricatæ, late ovatæ, acutæ, castaneæ, coriaceæ, impresso-punctulatæ, dorso sub apice tenuiore submembranaceo subcarinatæ, *flores* arcuatos oblongos compressos duplo superantes. *Perianthium* rigidum, ferrugineum, biseriale, sexglume, *glumis* oblongo-lanceolatis, inæqualibus, *externis lateralibus* conduplicatis, carinatis, carinis glabris, *intermedia* planiuscula, *internæ* tenuiores, breviores. *Filamenta* complanata. *Antheræ* exsertæ, lineari-oblongæ, apiculatæ, dorso ferrugineæ.—Plantæ femineæ *culmus, vaginæ, inflorescentiaque*

prorsus ut in mare; *spiculæ femineæ* autem cylindraceo-lanceolatæ, 1-floræ, 3–4 lin. longæ 1 lin. latæ. *Bracteæ* infimæ ut in mare, superiores 2–3 oblongo-lanceolatæ, mucronatæ. *Perianthium* minutum, hyalinum, biseriale, sexglume, *glumis* subæqualibus, ovatis, obtusiusculis. *Ovarium* oblongum, stipitulatum, 1-loculare, superne *disco* carunculato flavido donatum. *Stylus* brevis, crassus, castaneus. *Stigmata* 2, longiuscula, subulato-lanceolata, intus villosa. *Fructus* ....

8. H. NITIDUS, sp. n. Culmis pedalibus, simplicibus, compressiusculis; vaginis culmeis 1–1½-pollicaribus, arctis, coriaceis, nitidis, sub apice setaceo-mucronatis; spiculis masculis 5–7, subclavatis, parvis, in cymam terminalem paniculiformem approximatis; bracteis laxiuscule imbricatis, longe aristatis; glumis externis rigidiusculis, acutatis; glumis internis oblongis, obtusis, apiculatis. Femina ignota.—Hypodiscus nitidus, *Nees ab E. MS. in herb. Sonder. sine descript.*

Hab. Pr. B. Sp. Ex. sp. s. ♂, in summa Winterhocksberg (Nov.), *Ecklon*!

Culmi erecti, pedales (et ultra?), simplices, compressiusculi, olivacei, impresso-punctulati, basi *squamis* ovatis spadiceis dense approximatis vestiti, superne remote vaginati, *vaginis* arcte convolutis, 1–2-pollicaribus, coriaceis, nitidis, castaneis, obsolete nervoso-striatis, sub apice obtusciusculo subulato-mucronatis. *Spiculæ* masculæ 5–7, in cymam terminalem paniculiformem aggregatæ, sessiles vel breviter pedicellatæ, pedicellis arcuatis, singulæ 3–4 lin. longæ, 3 lin. latæ, ovato-oblongæ vel subclavatæ. *Spathæ* 2–3, vaginiformes, spiculas imprimis omnino velantes, postea apertæ, demum deciduæ. *Bracteæ* arcte imbricatæ, oblongæ, longe acuminato-aristatæ, coriaceæ, fuscæ, ad margines pallidiores, *flores* ovatos v. subcompressos duplo triplove superantes. *Glumæ externæ* 3, æquales, ovatæ, acutatæ, rigidæ, ferrugineæ, *laterales* naviculari-conduplicatæ, carinatæ, carina lævi, *intermedia* nervo medio prominente notata. *Glumæ internæ* 3, externis vix breviores, hyalinæ, planiusculæ, oblongæ, obtusæ. *Antheræ* oblongæ, apiculatæ, dorso ferrugineæ, demum exsertæ.

9. H. WILLDENOVIA. Culmis simplicibus, erectis v. arcuatis, complanatis, sulcatis; vaginis compressis, arcte tubulosis, subulato-mucronatis; spiculis masculis solitariis, oblongis, compressis; bracteis ovato-oblongis, obtusis, subulato-mucronatis; glumis inæqualibus, externis membranaceis, liberis, internis hyalinis, duplo longioribus, plus minus connatis; antheris apiculatis: spiculis femineis solitariis, 1-floris; perianthio minuto, hyalino, 4–6-glumi; glumis distinctis, subæqualibus; ovario oblongo, stipitato, disco epigyno (stylopodio?) notato; stylis 2, linearibus, exsertis, intus villoso-stigmatosis.—Willdenovia striata, *Spreng. Syst. Vég.* i. p. 188, *fide N. ab E.*—Lepidanthus Willdenovia, *N. ab E. Linnæa*, v. p. 665, *quoad stirpem masculam.*—Restio sulcatus, *Kunth, Enum.* iii. p. 404; *Steud. Synop.* ii. p. 253.

Variat culmo breviore, latiore, vaginis mucronibusque vegetioribus.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, Cape Flats, *Eckl.* 85!; Hottentotshollandsberg (Sept. Oct.), *Eckl. et Zeyh.* 78. 8!; *Burchell,* 5646!

♂. Pampoes Kraal, *Eckl. et Zeyh.* 77. 9!; Caledon, *Zeyher*! n. 4352!; *Burchell,* 6662!, 8545!

Culmi cæspitosi, ad basim *squamis* coriaceis, ovato-oblongis, laceris, dense approximatis vestiti. *Culmi steriles* 6–8-pollic., simplices, stricti vel arcuati, compressi, sulcato-striati, purpureo maculati; *vaginæ* oblongæ, compressæ, arctæ, coriaceæ, sub apice tenuore concolori valide subulato-mucronatæ. *Culmi fertiles* tenuiores, longiores, plerumque stricti, præ ceteris sterilibus conformes; *vaginæ* eis culmorum sterilium conformes, nisi magnitudine minore mucroneque multo breviore tenuioreque. *Spiculæ* masculæ oblongæ, erectæ, compressæ, 6–8 lin. longæ, 2 lin. latæ, singulæ *spatha* aperta aristata spiculam æquante suffultæ. *Bracteæ* arcte imbricatæ, ellipticæ, coriaceæ, ferrugineo maculatæ, sub apice obtusiusculo mucronato-aristatæ, *flores* oblongo-lanceolatos arcuatos paulo superantes. *Perianthium* inæqualiter biseriale, sexglume. *Glumæ externæ* membranaceæ, ferrugineæ, mucronatæ, *laterales* oblongæ, conduplicatæ, carinatæ, carina glabra; *gluma intermedia antica,* conformis, planiuscula, nervo medio prominente donata. *Glumæ internæ* 3, hyalinæ, externis dimidio longiores, subspathulatæ, lanceolatæ, basi in tubum connatæ, tubo brevi superne inæqualiter diviso, lacinia altera plana omnino libera, duabus nonnisi ad apices connatis, et ad margines externos involutis. *Filamenta* liguliformia, albida, longitudine glumarum internarum. *Antheræ* lineari-oblongæ, apiculatæ, dorso ferrugineæ, demum exsertæ.—Planta feminea masculinæ conformis. *Spiculæ* minores, tenuiores, 1-floræ. *Perianthium* minutum, ut videtur, biseriale, 6-glume, *glumis* hyalinis oblongis, externis majoribus, mucronatis, omnibus liberis. *Ovarium* oblongum, obtusum, 1-loculare, brevissime stipitatum, superne *disco* crasso epigyno donatum. *Styli* duo, decidui, intus stigmatoso-villosi. *Fructus* ....

Nees established his genus *Lepidanthus* on the male flowers only, the female plant being at the time unknown to him, and was probably led to do so from the smaller size of the outer glumes of the perianth, as contrasted with the inner ones; Nees also describes the inner glumes as "brevi spatio connatæ." Kunth, under the head of *Restio sulcatus*, describes the glumes nearly in the same terms as above given, and which apply, so far I have seen, in the majority of cases; but the degree of union seems to vary; so also in the case of the female flower the number, size, and form of the glumes differ in different specimens.

10. H. Neesii, sp. n. Culmis simplicibus, strictissimis, 18-pollic., teretibus, fistulosis, profunde longitudinaliter sulcatis; vaginis arcte convolutis, bipollicaribus, coriaceis, superne membranaceis, laceris, lon-

giuscule setaceo-aristatis; spiculis masculis 5–8, in cymam simplicem linearem disticham dispositis, singulis oblongis, ob spathas deciduas denudatis; bracteis arcte imbricatis, chartaceis, ferrugineis, oblongis, longe acuminatis; glumis omnibus conformibus, oblongis, aristatis; antheris apiculatis: spiculis femineis 2–3, in apice culmi distiche dispositis, singulis 1-floris, oblongis, erectis, 4–6 lin. longis, spatha vaginiformi duplo longiore suffultis; bracteis acuminato-aristatis, ferrugineis; glumis parvis oblongis, apiculatis; ovario oblongo, 1-loculari, superne lobis clavatis notato; stylo unico, in stigmata 2 linearia elongata diviso.—Leucoplocus striatus, *Nees, MS. in herb. Sond., absque descript.*

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, Steenbokriet, *Eckl.*!, sine numero.

Culmi ad basin cæspitosi, *squamis* ovatis oblongis coriaceis ferrugineis, sursum increscentibus dense vestiti, superne teretes, simplices, fistulosi, 18-pollicares, crassitie pennæ corvinæ, cinnamomei v. olivacei, profunde sulcati. *Vaginæ culmeæ* remotiusculæ, arcte convolutæ, 1–2-pollicares, coriaceæ, fuscæ, ad margines subhyalinæ, laceræ, sub apice obtusiusculo membranaceo setaceo-aristatæ. *Spiculæ* masculæ 5–8, in cymam simplicem linearem 2-pollicarem, *spathis* deciduis denudatam dispositæ, singulæ oblongæ, 4–6 lin. longæ, erectæ, plurifloræ, rachi complanatæ impositæ. *Flores* stipitulati, oblongi v. cuneati, remotiusculi, singuli *bracteis* singulis lanceolatis acuminatis chartaceis albidis, quam ipsi vix longioribus, suffulti. *Perianthium* biseriale, 6-glume; *glumæ externæ* 3, oblongæ, longe acuminato-aristatæ, cymbiformes, ferrugineæ, carinatæ; *glumæ internæ* conformes, magnitudine ⅓ *majores*. *Antheræ* lineari-oblongæ, dorso ferrugineæ, apiculatæ.—*Spiculæ femineæ* 2–3, in apice culmi, in spicam simplicem linearem disticham dispositæ, singulæ lineari-oblongæ, erectæ, 3–5 lin. longæ, *spatha* aperta vaginiformi spiculam duplo superante suffultæ. *Bracteæ* arcte imbricatæ, ovato-oblongæ, longiuscule acuminato-aristatæ. rigidæ, ferrugineæ. *Flos* unicus, terminalis. *Perianthium* parvum, biseriale, sexglume, *glumis* oblongis, acuminatis, membranaceis. *Ovarium* oblongum, glumas duplo triplove superans, superne lobis clavatis carnosis notatum, 1-loculare. *Stylus* unicus, infra medium in *stigmata* 2 longissima papilloso-villosa divisus.

11. H. ARGENTEUS. Culmis simplicibus, teretibus, obscure striatis; vaginis arctis, oblongis, longe acuminatis, coriaceis, ad margines membranaceis, laceratis; spiculis masculis 00, in cymas paniculiformes densas terminales aggregatis, singulis ovatis v. subrotundis; bracteis arcte imbricatis, oblongo-lanceolatis, aristatis, chartaceis, albidis; floribus compressis, arcuatis; glumis oblongis, acuminato-mucronatis, externis lateralibus carinatis, internis vix brevioribus vel etiam longioribus: spiculis femineis solitariis vel geminis, oblongis, ½-pollicaribus et ultra, 1-floris; perigynio nullo (?); fructu stipitato, stipite crasso,

irregulariter lobato.—Leucoplœus argenteus, *N. ab E. in Lindl. Nat. Syst.* ed. 2. p. 450, *et in herb. Sond.* (*nomen tantum*).—Restio argenteus, *Thunb. fide N. ab E. l. c., sed vix.*

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Eckl. et Zeyh.* 52. 8! et 75. 5!; Caledon, *Zeyher*, 4338!

♂, *Drège*, 1642!, pro parte; *Burchell*, 7901!, 8117!; Palmitrivier, *Eckl.* 972!

♀, *Burchell*, 7058!, 8129!; *Zeyher*, 4337!

Culmi cæspitosi, erecti, teretes, simplices, 2–3-pedales, crassitie pennæ gallinaceæ, olivacei, leviter longitudinaliter striati, albido-lepidoti, basi *squamis* ovatis v. oblongis coriaceis ferrugineis nitidis dense approximatis vestiti, superne remote vaginati. *Vaginæ culmeæ* pollicares et ultra, arctæ, longiuscule acuminatæ, fuscæ, coriaceæ, ad margines apicemque tenuiores, laceræ. *Panicula* mascula terminalis, pluriramosa, ramulis filiformibus, *spathis* 3–4 magnis apertis nitidis vaginiformibus, demum deciduis, munita. *Spiculæ* masculæ oblongo-ovatæ v. subrotundæ. *Bracteæ* arcte imbricatæ, oblongæ, longe acuminatæ, membranaceæ, albidæ, *flores* ovatos compressos arcuatos stipitulatos 2–3-plo superantes. *Perianthium* sexglume. *Glumæ* rigidiusculæ, ferrugineæ, oblongo-lanceolatæ, acuminato-mucronatæ; *externæ laterales* naviculari-conduplicatæ, carinatæ, carinis glabris, *intermedia* planiuscula; *internæ* 3, externas æquantes vel superantes, *laterales* ad margines superne parum involutæ, *intermedia* planiuscula. *Antheræ* lineares, ferrugineæ, mucronulo albido terminatæ.—*Spiculæ* femineæ in apice culmi, solitariæ, nunc 1–3, oblongæ, erectæ, pollicares, *spathis* vaginiformibus magnis coriaceis nitidis striatis margine laceris suffultæ. *Bracteæ* rigidæ, oblongo-lanceolatæ, acuminatæ, pallidæ, versus apices purpurascentes, nervoso-striatæ. *Flos unicus* terminalis, bractea stipante brevior. *Perianthium* nullum (an semper?). *Fructus* oblongus, obtusus, osseus, lævis, nigrescens, 1-locularis, 1-spermus, stipiti brevi crasso irregulariter lobato impositus. *Semen* ex apice fructus pendulum.

HYPOLÆNA, *Brown, Prod.* 251; *Kunth. En.* iii. p. 451.

Inflorescentia mascula pluristachya, amentacea, spiculis uni- vel plurifloris; inflorescentia feminea solitaria, spicata, spicis 1-floris. Flores dioici. Perianthium biseriale, sexglume, glumis æqualibus vel inæqualibus. Stamina 3. Antheræ peltatim affixæ, 1-loculares, longitudinaliter dehiscentes. Ovarium sessile, uniloculare, stylo 2–3-partito deciduo coronatum. Ovulum unicum, ex apice loculi pendulum. Fructus ovatus vel subglobosus, osseus, lævis, indehiscens, vertice plerumque disco epigyno crasso flavido (stylopodio?) superatus, basi perianthio persistente interdum minuto cinctus.—Herbæ *Restionis* habitu. Culmi ramosi, vaginati, vaginis persistentibus.

* *Spiculæ masculæ axem per marginem respicientes* (*ut in* Lolio).

1. H. LAXIFLORA, *Nees ab Esenb. in Linnæa*, v. p. 663; *Kunth, Enum.* iii. p. 451; *Steud. Synops.* ii. p. 264.

Hab. Pr. B. Sp. Ex. sp. s. ♂, Table Mount (Oct.), *Eckl.* n. 843!; *Eckl. et Zeyh.* 56. 6!, 70. 10!

♂ et ♀, *Drège*, 10, *pro parte.*

This species, like its congeners, varies in the size of its parts. Ecklon and Zeyher's n. 70.10 is a very slender form of this species.

2. H. ECKLONIANA, sp. n. Culmis cæspitosis, teretibus v. subcompressis, infra medium dichotome ramosissimis, ramis virgatis, erectis, compressis; vaginis arctis, compressis, coriaceis, subulato-mucronatis; spiculis masculis 3–5, erecto-patentibus, in cymam simplicem terminalem approximatis, singulis cylindraceo-oblongis, multifloris; bracteis undique imbricatis, oblongis, obtusis, apice laxiusculis; floribus subtrigonis; glumis externis lineari-oblongis, glumis internis latioribus; antheris apiculatis: spiculis femineis in apice ramulorum, plerumque solitariis, nunc 2–3 approximatis, oblongis, demum obcuneatis, 1-floris; bracteis subulato-mucronatis; glumis oblongis, obtusis, subæqualibus, fructum æquantibus; ovario oblongo, uniloculari, stylo brevissimo superato; stigmatibus 2, linearibus, revolutis, exsertis; fructu duro, indehiscente.—Hypolæna Eckloniana, *Nees, MS. in herb. Sonder., sine descript.*

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Masson*!, *Burchell*, 7844!, 7897!, 8267!; *Sieber, Fl. Cap.* 228!

♀, Hottentotsholland Kloof, *Eckl.* 950!; *Dr. Thom*, 1031, *pro parte*; *Admiral Grey*!

♂ et ♀, Gr. Houhoek (July), *Zeyher*, 4348!; Muysenberg, *Zeyher*, 4348 b!; Simonstadt, *Eckl.* 997!; *Dr. Thom*, 632!, *pro parte.*

Culmi 1–3-pedales, crassitie pennæ gallinaceæ, ad basim cæspitosi, *vaginis* coriaceis laceris dense vestiti, teretes, striolati, purpureo maculati, infra medium dichotome ramosi, *ramique* compressi, virgati, elongati, impresso-punctulati, vix striolati, iterum ramulosi. *Vaginæ culmeæ* remotiusculæ, 6–8 lin. longæ, arcte convolutæ, oblongæ, ellipticæ, coriaceæ, fuscæ, striolatæ, ad margines concolores, tenuiores, sub apice acutiusculo subulato-mucronatæ. *Spiculæ masculæ* 3–5, in cymam simplicem terminalem distícham 1–1½-pollicarem dispositæ, singulæ erectæ vel horizontaliter patentes, cylindraceo-oblongæ, 5–6 lin. longæ, 1–1½ lin. latæ, basi *spatha* aperta vaginiformi ipsa dimidio breviore, demum decidua, suffultæ, rachin flexuosam, complanatam per margines respicientes. *Bracteæ* 6-fariam imbricatæ, apice subpatentes, oblongæ, cymbiformes, obtusiusculæ, submuticæ, coriaceæ, ferrugineæ, nitidæ, flores stipitulatos paulo superantes. *Perianthium* subtrigonum nec compressum, bi-

seriale, sexglume; *glumæ externæ* 3, ima basi connatæ, æquales, lineari-oblongæ, ferrugineæ, rigidæ; *glumæ internæ* externas longitudine æquantes, iisque latiores, oblongæ, obtusæ, hyalinæ; *filamenta* complanata; *antheræ* lineari-oblongæ, apiculatæ, dorso ferrugineæ.—*Spiculæ femineæ* in apice ramorum solitariæ vel 3–5 distiche spicatimque dispositæ, singulæ 1-floræ, cylindraceo-oblongæ, demum obpyramidales, 4–6 lin. longæ, 1–1½ lin. latæ, *spatha* aperta vaginiformi suffultæ. *Bracteæ* steriles 2–3, vaginiformes, subulato-mucronatæ, apice demum patentes; *bractea* axi contigua oblonga, obtusa, mutica, dorso bicarinata, carinis calvis; *bractea fertilis* conformis, florem terminalem involvens, eoque vix longior. *Perianthium* biseriale, 6-glume, *glumis* omnibus subæqualibus, oblongis, obtusis, nervoso-striolatis, externis ferrugineis, internis subhyalinis, ovarium æquantibus, eique appressis. *Fructus* cylindraceo-oblongus, coriaceus, nitidus, lævis, inferne flavescens, superne castaneus, 1-locularis, 1-spermus, *stylo* brevi terminali persistente superatus. *Stigmata* 2, linearia, revoluta, intus villosa.

This appears to be a common species, and varies in stature, number of spikelets, &c. The male plant is in the Linnean herbarium with this label attached, "12 *Restio paniculatus*." It differs, however, considerably from the *R. paniculatus* of Rottböll.

3. H.? IMPOLITA.—Restio impolitus, *Kunth, Enum.* iii. p. 404; *Mast. Journ. Linn. Soc.* viii. p. 249.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Zeyher*, 4349, *pro parte*!; Palmitrivier, *Eckl.* 951!; Talfelberg, *Eckl. et Zeyh.* 56. 6!; *Burchell*!, *Drège*, 67!

This plant is so like the other species of this genus that I have little hesitation in referring it here, though the female plant is as yet unknown.

4. H.? ASPERA, sp. n. Culmis cæspitosis, erectis, filiformibus, striatis, versus medium dichotome ramosis, ramisque erecto-patentibus, albido-tuberculatis; vaginis arctis, ellipticis, acuminato-aristatis, coriaceis, superne profunde hyalino-membranaceis; cymis masculis terminalibus, pluristachyis, erectis, dichotome vel simpliciter ramosis, ramis linearibus, erectis; spiculis oblongis, compressis, 3-floris, axem per margines respicientibus; spathis bracteisque oblongo-lanceolatis, acuminato-aristatis, superne hyalinis; floribus subtrigonis; glumis externis lateralibus, majoribus, postice versis.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Burchell*, 8065!, 8069!; *Ecklon et Zeyh.* 56. 6!; Hottentotshollandberg, *Eckl. et Zeyh.* 59. 5!; Palmitrivier, *Eckl.* 951!; *Dr. Thom*, 632, *pro parte*.

Radices fibrosæ, fibris simplicibus, duris, griseis, flexuosis. *Culmi* cæspitosi, ad basim *vaginis* approximatis, coriaceis, striatis, laceris,

sursum increscentibus vestiti, superne remote vaginati, teretes, filiformes, stricti, rigidi, versus medium dichotome ramosi, *ramique* erecto-patentes vel curvati, tuberculis majusculis albidis asperati. *Vaginæ culmeæ* arcte tubulosæ, 4–5 lin. longæ, coriaceæ, striatæ, fuscæ, sub apice hyalino obtuse bilobato, tandem deciduo, acuminato-aristatæ. *Spiculæ* masculæ 00, in cymas erectas, lineares, pauciramosas, ad apices ramulorum desinentes, distiche remotiusculeque dispositæ, singulæ 3-floræ, lineari-oblongæ, compressæ, 3–4 lin. longæ, *spatha* oblonga acuminata coriacea ferruginea superne hyalina spiculamque æquante suffultæ, *rachis* flexuosam complanatam per margines respicientes. *Bracteæ* laxiuscule imbricatæ, spathæ omnino conformes, nisi magnitudine minore. *Perianthium* biseriale, sexglume. *Glumæ externæ* oblongæ, obtusiusculæ, *laterales* duæ naviculari-conduplicatæ, carinatæ (carinis villosulis), rigidiusculæ, ita postice positæ ut axin spiculæ (rachillam) spectent; *glumæ* aliæ breviores, tenuiores, planiusculæ, oblongæ, inter se æquales. *Filamenta* brevia, albida. *Antheræ* lineari-oblongæ, apiculatæ, flavidæ, dorso ferrugineæ.

Some of Burchell's specimens are of more slender habit than the above, and have the spikelets smaller and less crowded.

5. H. TENUIS, sp. n. Culmis filiformibus, striatis, tetragonis; vaginis arctis, setaceo-aristatis; spiculis masculis 3–4, singulis 1-floris, in spicam terminalem dispositis; floribus compressis, axem per dorsum respicientibus; glumis subinæqualibus: spiculis femineis solitariis, 1-floris; glumis obovatis, spongiosis, fructu oblongo carneo paulo brevioribus.—Restio tenuis, *Burchell MS. in herb. Hook.*!

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Burchell*, 7028!

♀, *Burchell*, 7360!

Rhizoma (ut videtur) subterraneum, simplex, erectum, spongiosum, spithamæum, crassitie pennæ anserinæ, *vaginis* magnis ellipticis coriaceis ferrugineis nitidis, superne sensim minoribus munitum. *Culmi* cæspitosi, erecti, filiformes, rigidi, nodosi, tetragoni, 12–18 poll. longi, simplices vel parum dichotome ramosi, *ramique* conformes, flavidi, impresso-punctulati, ad angulos lineis purpureis notati. *Vaginæ culmeæ* subpollicares, arcte convolutæ, ellipticæ, coriaceæ, striatæ, ferrugineæ, sub apice acutissimo hyalino membranaceo longiuscule setaceo-aristatæ. *Spiculæ* masculæ 3–4, remotiusculæ, in spicam linearem terminalem dispositæ, singulæ 1-floræ, oblongæ, *spatha* oblongo-lanceolata coriacea pallide ferruginea apice longissime setaceo-aristata, demum decidua suffultæ. *Flores* 1–2 lin. longæ, spatha v. bractea 3–4-plo breviores, erecti, brevissime pedicellati, oblongi, axem complanatam flexuosam per dorsum respicientes, omnes, nisi forte terminalis, fertiles. *Perianthium* biseriale, sexglume, *glumis* oblongis, papyraceis, pallide ferrugineis, nervo medio notatis, *externis lateralibus* conduplicatis, carinatis (carina glabra), postice versus axem refractis, *glumis internis* tenuioribus, pallidioribus. *Filamenta*

albida, tenuissima. *Antheræ* lineares, apiculatæ, flavidæ, filamenta æquantes, inclusæ.—Plantæ femineæ *culmi vaginæque* ut in mare. *Spiculæ femineæ* in apicibus ramorum solitariæ, 1–2-floræ, 5–6 lin. longæ, sing. *spatha* coriacea, fusca, oblongo-lanceolata, setaceo-aristata munitæ. *Flos* fertilis unicus, sessilis, spatha v. bractea 3–4-plo brevior; *flos sterilis* (si adest) pedicellatus, rudimentarius. *Perianthium* biseriale, sexglume; *glumis* subæqualibus, oblongo-ovatis vel spathulatis, subspongiosis, fuscis, nervo medio notatis, *externis lateralibus*, naviculari-conduplicatis. *Ovarium* subtrigonum. *Styli* 2, superne plumoso-stigmatosi, demum decidui. *Fructus* obovatus v. subglobosus, indehiscens, osseus, ferrugineus, lævis, unilocularis, glumis persistentibus paulo longior. *Semen* unicum, ex apice loculi pendulum. *Albumen* corneum.

Practically it makes little difference whether the male inflorescence be considered to consist of a single spikelet with three or four flowers, each provided with its sheathing bract, or whether it be described as consisting of three or four distinct 1-flowered spikelets. From the size and ultimate fall of the bracts (spathes), as well as from the distance between the flowers, and the length of the axis between them, I have in the foregoing description adopted the latter view.

The florets are placed with their backs against the axis, the outer lateral glumes being a little twisted to allow of the axis fitting in between them.

6. H.? GRACILIS, sp. n. Culmis cæspitosis, 1–2-pedalibus, teretibus, versus medium dichotome ramosissimis; ramulis filiformibus, subfasciculatis, compressiusculis; vaginis arctis, ellipticis, coriaceis, striatis, filaceo-aristatis; spiculis masculis in apicibus ramulorum solitariis, erectis v. patentibus, oblongis, spatha vaginiformi filaceo-aristata suffultis; bracteis oblongis, mucronatis; floribus vix compressis; feminea adhuc ignota.—Hypolæna gracilis, *Nees MS. in herb. Sonder., absque descript.*

Hab. Pr. B. Sp. Ex. sp. s. ♂, Muisenberg, n. 4347, *Zeyher*!; Simonstadt, *Zeyher*, 1006!, *et C. Wright*, 500!

Rudices filiformes, flexuosi. *Culmi* cæspitosi, decumbentes, 1–2-pedales, crassitie pennæ corvinæ, basi spatio 2–3-pollicari, *vaginis* arctis, coriaceis, striatis, fuscis, laceris, approximatis muniti, ad nodos incrassati, superne remote vaginati, teretes, olivacei, purpureo maculati, obsolete tuberculati, striolati, infra medium dichotome ramosi; *ramis* erectis, iterum iterumque ramulosis; *ramulis* subfastigiatis, compressis, filiformibus, elongatis. *Vaginæ culmeæ* pollicares, arcte ellipticæ, acutatæ, coriaceæ, fuscæ, striatæ, purpureo maculatæ, filaceo-aristatæ; *vaginæ ramulorum* conformes nisi magnitudine minore. *Spiculæ masculæ* in apicibus ramulorum solitariæ.

pluriflorae, ovato-oblongæ, demum cylindraceæ, *spatha* aperta vaginiformi brevi suffultæ. *Bracteæ* laxiuscule imbricatæ, ovato-oblongæ, cymbiformes, coriaceæ, ferrugineæ, nitidæ, apice filaceo-aristulatæ, *flores* subtrigonos stipulatos duplo superantes. *Glumæ externæ* 3, oblongæ, ferrugineæ, rigidiusculæ, carinatæ, *lateralium* carinis villosulis, *intermediæ* carina glabra; *glumæ internæ* oblongæ, obtusæ, hyalinæ, externas longitudine æquantes, iisque latiores. *Filamenta* tenuia; *antheræ* oblongæ, apiculatæ, flavidæ, dorso ferrugineæ.

7. H. FILIFORMIS, sp. n. Culmis cæspitosis, bipedalibus, strictissimis, infra medium dichotome ramosis, ramis ramulisque elongatis, filiformibus; vaginis arcte convolutis, ellipticis, coriaceis, striatis, mucronatis; spiculis masculis 00, erectis, in paniculas terminales elongatas parce ramosas aggregatis, singulis late oblongis, spatha aristulata suffultis; bracteis arcte imbricatis, oblongis, mucronatis; floribus compressis; glumis externis villoso-carinatis. Femina latet.

Hab. Pr. B. Sp. Ex. sp. s. ♂, Gr. Houhoeck (July), *Zeyher*, 4349, *pro parte*!; *Dr. Thom*, 1031, *pro parte*!

Radicis fibrillæ sublignææ, graciles, flexuosæ. *Culmi* dense cæspitosi, erecti, bipedales, crassitie pennæ passerinæ, teretes, infra medium dichotome ramosi, *ramique* stricti, elongati, cinnamomeo-fusci, impresso-punctulati. *Vaginæ culmeæ* 6–10 lin. longæ, nisi ad ramificationes arctæ, ellipticæ, coriaceæ, striatæ, fuscæ, ad margines concolores, tenuiores, apice filaceo-aristatæ. *Panicula mascula* terminalis, linearis, 2–3 poll. longa, parce ramosa, pluristachya. *Spiculæ* oblongæ, erectæ, 3–4 lin. longæ, 1½ lin. latæ, *spathis* vaginiformibus, longe aristatis, ipsis brevioribus suffultæ, rachin flexuosam complanatam per dorsum respicientes. *Bracteæ* apice laxiusculæ, oblongæ, cymbiformes, aristulatæ, coriaceæ, nitidæ, *flores* oblongos compressos parum superantes. *Glumæ externæ* oblongæ, ferrugineæ, rigidiusculæ, *laterales* conduplicatæ, villoso-carinatæ, *intermedia* planiuscula. *Glumæ internæ* 3, oblongæ, subhyalinæ, externis paulo breviores. *Filamenta* linearia. *Antheræ* oblongæ, apiculatæ, flavidæ, dorso ferrugineæ.

8. H.? ANCEPS, sp. n. Culmis filiformibus, complanatis; vaginis arctis, valide subfoliaceo-mucronatis; spiculis masculis compressis, 1–2-floris, spicatim dispositis; floribus axem per dorsum respicientibus; glumis subæqualibus, oblongo-lanceolatis.—Restio anceps, *Burchell, MS. in herb. Hook.*!

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Burchell*, nn. 5896!, 7080!

Culmi cæspitosi, erecti, 12–18-poll., crassitie pennæ corvinæ, simplices, vel parum dichotome ramosi, *ramique* erecti, flexuosi vel patentes, complanati, purpurascentes, albo maculati, ad margines tuberculis parvis exasperati. *Vaginæ culmeæ* 8–10 lin. longæ, arctæ, coriaceæ, oblongæ, fuscæ, albo maculatæ, superne membranaceæ, sub apice acutiusculo valide mucronatæ, mucrone erecto. *Spiculæ masculæ* 3–4, in spicam terminalem linearem disticham approximatæ, sing.

2–3 lin. longæ, 1–2-floræ, obcuneatæ, compressæ, bractea vel spatha vaginiformi suffultæ, rachillam flexuosam complanatam superne (bractea decurrente) alatam margine uno respicientes. *Flores* bracteis paulo breviores, stipitulati, oblongi. *Glumæ* oblongo-lanceolatæ, cartilagineæ, nervo medio notatæ; *externæ* pallide ferrugineæ, *laterales* duæ naviculari-conduplicatæ, carinatæ, carina glabra; *glumæ internæ* 3, inter se æquales, externis breviores pallidioresque, superne ad margines nonnunquam involutæ. *Antheræ* lineari-oblongæ, apiculatæ, flavidæ, filamentis gracilibus paulo breviores.

** *Spiculæ masculæ axem per dorsum respicientes (ut in* Tritico*).*

9. H.? VIRGATA, sp. n. Culmis erectis, filiformibus, teretibus v. vix angulatis, dichotome ramosis, aphyllis; vaginis arctis, vix pollicaribus, sub apice obtuso longe mucronatis; spiculis masculis 8–10, in spicam disticham linearem dispositis, singulis ellipticis, erectis, spathis vaginiformibus æquilongis suffultis; bracteis arcte imbricatis, oblongo-obtusis, mucronatis, flores oblongos compressos superantibus; glumis externis oblongis, lateralium altera longiore, internis æqualibus, tenuioribus; antheris linearibus. Feminea adhuc ignota.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Burchell*, 7187!

Culmi 1–2-ped., cæspitosi, teretes vel subangulati, crassitie pennæ corvinæ, ad basin *vaginis* coriaceis fuscis dense approximatis obtecti, superne remote vaginati, versus medium dichotome ramosi, *ramique* erecti, olivacei, albo-lepidoti. *Vaginæ* arcte convolutæ, ellipticæ, coriaceæ, fuscæ, sub apice obtuso tenuiore longe mucronatæ. *Spiculæ* masculæ 8–10, in spicam linearem, erectam, disticham remotiuscule dispositæ, singulæ pluriforæ, ellipticæ, erecto-patentes, 3–4 lin. longæ, 1–2 lin. latæ, *spatha* aperta vaginiformi, spiculam ipsam æquante, suffultæ. *Bracteæ* arcte imbricatæ, oblongæ, obtusæ, coriaceæ, sub apice mucronatæ, flores oblongos compressos stipitulatos vix duplo superantes. *Glumæ externæ* oblongæ, rigidiusculæ, *laterales* inæquales, naviculari-conduplicatæ, carinatæ, carina ferrugineo-villosa, *intermedia* planiuscula. *Glumæ internæ* 3, conformes, hyalinæ, externis paullo breviores. *Filamenta* linearia, albida. *Antheræ* lineares, apiculatæ, flavidæ, dorso ferrugineæ. *Pistilli rudimentum* minutum vel nullum.

The irregularity of the outer lateral glumes, one of which overlaps the other at the summit, is a noteworthy character of this species.

10. H.? BURCHELLII, sp. n. Culmis cæspitosis, bipedalibus, teretibus, versus medium dichotome ramosis, ramis elongatis, virgatis, erectopatentibus; vaginis arctis, brevibus, coriaceis, superne membranaceis, laceris; spiculis masculis pluribus, in cymas lineares distichas terminales dispositis, rachin per dorsum spectantibus; bracteis laxius-

cule imbricatis, lanceolatis, profunde hyalino-membranaceis, basi ad margines decurrentibus; glumis oblongis, acutis, externis cartilagineis, lateralibus inæqualibus, naviculari-conduplicatis, villoso-carinatis, internis membranaceis, brevioribus; antheris apiculatis.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Burchell,* 8116 !, 7632 !, 7894 a !

Culmi erecti, bi- tripedales, teretes, crassitie pennæ gallinaceæ, basi spatio bi- tripollicari *vaginis* coriaceis, laceris, arcte approximatis vestiti, superne remote vaginati, infra medium dichotome ramosi, *ramique* erecto-patentes, iterum ramulosi, olivacei, albo-lepidoti, ramuli ultimi compressiusculi. *Vaginæ culmeæ* arcte convolutæ, 5–8 lin. longæ, coriaceæ, striatæ, fuscæ, superne hyalino-membranaceæ, ibique demum deciduæ. *Vaginæ ramulorum* conformes, nisi magnitudine minore, sub apice membranaceo acutiusculo, interdum bilobo, acuminato-aristatæ. *Spiculæ masculæ* 00, in cymam pluristachyam paniculiformem terminalem erectam dispositæ, singulæ plurifloræ, cylindraceæ, oblongæ, 1–2 lin. longæ, ¾ lin. latæ, *spatha* aperta vaginiformi ipsas æquante suffultæ, rachin flexuosam compressam per dorsum spectantes. *Bracteæ* laxiuscule imbricatæ, oblongo-lanceolatæ, filaceo-aristatæ, coriaceæ, superne profunde hyalino-membranaceæ, *flores* stipitulatos oblongos compressos duplo superantes. *Perianthium* biseriale, 6-glume; *glumis externis* inæqualibus, oblongo-lanceolatis, cartilagineis, *lateralibus* 2 naviculari-conduplicatis, villoso-carinatis, ex his altera longior, *intermedia* planiuscula; *glumæ internæ* 3, æquales, planiusculæ, membranaceæ, externis parum breviores. *Filamenta* brevia. *Antheræ* lineari-oblongæ, apiculatæ, flavidæ, dorso ferrugineæ.

WILLDENOVIA, *Thunb. Act. Holm.* (1790); *Kunth, Enum.* iii. p. 452; *Steud. Syn.* ii. p. 262.

1. W. TERES, *Thunb. Act. Holm.* 1790, p. 27, t. 2. f. 2; *Kunth, Enum.* iii. p. 452; *Steud. Synops.* ii. p. 262.—Restio dichotomus, *Gaert. Fruct.* ii. 12. t. 82. f. 3, *excl. syn.*

Hab. Pr. B. Sp. Ex. sp. s. ♀, *Drège,* n. 2482 !; Zeckoesvalley, *Ecklon,* n. 3 !

? ♂, Mosselbank Rivier, *Ecklon,* n. 77 !

To this species, not without hesitation, I refer a male specimen of Ecklon's (n. 77) in Dr. Sonder's herbarium, to which Nees gave the name *W. brevis,* and of which the following is a description:—

Culmi decumbentes, 1–1½-pedales, basi *squamis* approximatis coriaceis spadiceis, nitidis, oblongis, valide mucronatis dense obsiti, superne teretes, crassitie pennæ corvinæ, olivacei, albo-lepidoti, versus medium dichotome vel subfasciculatim ramosi, *rami* arcuati. *Vaginæ culmeæ* vix pollicares, laxiuscule convolutæ, coriaceæ, flavidæ, demum fuscæ, puncticulatæ, mucronato-aristatæ, ad margines apicemque profunde

hyalino-membranaceæ, pars terminalis membranacea cum inferiore articulata et demum decidua. *Spiculæ masculæ* in apicibus ramorum solitariæ (an semper?), erectæ, oblongæ, 6–8 lin. longæ, 2–3 lin. latæ, *spatha* coriacea aperta vaginiformi suffultæ. *Bracteæ* oblongo-lanceolatæ, acutatæ, membranaceæ, superne pallide ferrugineæ, *flores* remotiusculos duplo superantes. *Perianthium* biseriale, 6-glume, *glumis* linearibus, hyalinis; *antheræ* lineares, apiculatæ, dorso ferrugineæ.

2. W. STRIATA, *Thunb. Act. Holm.* 1790, p. 27, t. 2. f. 1; *Kunth, Enum.* iii. p. 453; *Steud. Syn.* ii. p. 262.—Nematanthus Ecklonii, *Nees ab Esenb. Linnæa*, v. p. 662, teste Neesio ipso, in herb. Sonder., quoad pl. masc.—Willdenovia neglecta, *Steud. Synops.* ii. p. 263.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Zeyher*, 1736!; *Ecklon et Zeyher, sine numero*!

♂, "ad pedem montis Tigridis et inter Weinberg et montem Stellenbosch (Maio, Junio, Julio)," et Olifants River, *Ecklon*!, *Burchell*, 787!, *Drège*, n. 2520!

♀, *Drège*, n. 2516!, n. 2515 b!

I follow Kunth in referring Drège's specimens (with which the others above cited correspond in all essentials) to *W. striata*, Thunb., though the latter author represents the fruit as provided with "stipite cupulari 6-partito." In all the specimens that I have examined, the fruit has simply been raised on a very short, smooth, not lobed, stipes. Kunth, in describing Drège's specimens, seems to have overlooked the punctations on the fruit, which he describes as smooth, and hence probably led Steudel to form his *W. neglecta*, in which the fruit is rightly described as punctate. In point of fact, the markings on the fruit vary in different specimens, according to age &c. Drège's 2515 b, on which Steudel founded his species, does not differ materially from the others.

3. W. SULCATA, sp. n. Culmo decumbente, infra medium dichotome ramoso, ramisque erectis, teretibus v. subcompressis, longiusculis, sulcato-striatis; vaginis culmeis subpollicaribus, nisi ad ramificationes arcte convolutis, superne membranaceis, mucronato-aristatis; paniculis masculis pauciramosis; spiculis femineis solitariis vel geminis, cylindraceo-oblongis, demum obcuneatis, ½-pollicaribus; bracteis oblongo-ovatis, mucronatis; flore unico, stipitato, stipite carnoso integro (nec lobato); glumis 6, oblongo-ovatis, ovarium læve æquantibus; stylis duobus, distinctis.

Hab. Pr. B. Sp. Ex. sp. s. ♂, Cape Flats (*Martio*), *Ecklon*, n. 930!

♀, *Ecklon in herb. Sonder., sine numero!*

Culmi decumbentes, erecti, teretes, 2–3-pedales, crassitie pennæ gallinaceæ, infra medium dichotome ramosi, *ramique* elongati, compressiusculi, olivacei, longitudinaliter sulcato-striati, albo-lepidoti. *Vaginæ*

culmeæ pollicares, plerumque arcte convolutæ, ad ramificationes laxiusculæ, ellipticæ, coriaceæ, fuscæ, tenuiter sulcato-striatæ, acuminatæ vel mucronatæ, superne utrinque membranaceæ, parte terminali membranacea demum decidua. *Spiculæ masculæ* in cymam paniculatam, terminalem, 1–2-pollicarem dispositæ, *spathis* vaginiformibus subapertis intus nitidis demum deciduis suffultæ. *Flores* pedicellati, pedicello, ad basin, *bractea* lineari-lanceolata, ferruginea, membranacea, florem duplo triplove superante instructo. *Perianthium* æqualiter biseriale, 6-glume; *glumis* linearibus, ferrugineis, membranaceis. *Antheræ* lineari-oblongæ, apiculatæ, dorso ferrugineæ.—Plantæ femineæ *culmus vaginæque* ut in mare. *Spiculæ* 1-floræ, solitariæ vel geminæ, altera sessilis, altera pedicellata (pedicello complanato, spiculam æquante), singulæ cylindraceo-oblongæ, 4–5 lin. longæ, 1–1½ lin. latæ, demum obpyramidatæ, *spatha* aperta, quam spicula ipsa longiore, tardius decidua suffultæ. *Bracteæ* plurimæ, oblongæ, obtusiusculæ, membranaceæ, ferrugineo maculatæ, mucrone terminali nigrescente munitæ. *Flos* unicus, stipiticy lindraceo, crasso, carnoso, haud lobato, impositus. *Perianthium* biseriale et æqualiter 6-glume, *glumis* ovato-oblongis, obtusis, membranaceis, ferrugineo maculatis, *ovarium* oblongum, stipitulatum, superne punctulatum, uniloculare, uniovulatum subæquantibus. *Styli* duo, distincti, intus villoso-stigmatosi, tardius decidui. *Fructus* . . . .

The male plant has much the aspect of *W. striata*; but in the present species the sheaths are more closely convolute, and the flowers are larger. The female spikelets are scarcely half the size of those of *W. striata*, and more closely resemble those of *W. teres*, with which also they correspond in the oblong obtuse bracts.

4. W. LUCÆANA, *Kunth, Enum.* iii. p. 455; *Steud. Synops.* ii. p. 262.—Spirostylis Ecklonii, *Nees, MS. in herb. Sond.*

Hab. Pr. B. Sp. Ex. sp. s. ♂, Brakfontein, *Ecklon*!
♀, *Drège*, n. 2515a!, *Ecklon*, 84!, Gr. Houhoek, *Zeyher*, n. 4351!, *Eck. et Zeyh.* l. 11!

There is a male plant of this species in the Linnean herbarium, with the name "*Elegia*" on the label.

5. W. ARESCENS, *Kunth, Enum.* iii. p. 454, n. 3; *Steud. Synops.* ii. p. 262. n. 3.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Drège*, n, 2522!

6. W. FIMBRIATA, *Kunth, Enum.* iii. p. 455; *Steud. Synops.* ii. p. 262,
Hab. Pr. B. Sp. Ex. sp. s. ♀, *Drège*, n. 1635b!

7. W. CUSPIDATA, sp. n. Culmo gracili, tereti, dichotome ramoso, ramis patulis; vaginis arcte convolutis, longiuscule mucronato-aristatis, coriaceis, fuscis, ad margines præcipueque ad apicem hyalino-membranaceis; spiculis femineis solitariis vel geminis, obcuneatis; spatha

bracteisque longiuscule aristatis, aristis erectis; perianthio fructum impresso-punctatum subæquante, stylo unico; stigmatibus .... Mas latet.

Hab. Pr. B. Sp. Ex. sp. s. ♀, *Drège*, n. 2516!

Culmi **erecti, teretes, crassitie pennæ corvinæ (2-pedales?), dichotome ramosi, hique patuli, teretes, olivacei, albo-lepidoti, impresso-punctulati. *Vaginæ culmeæ* arcte convolutæ, longiuscule acuminatæ, coriaceæ, nitidæ, superne profunde hyalino-membranaceæ, parte superiore membranacea tardius decidua. *Spiculæ* femineæ in apice ramorum solitariæ vel geminæ, altera sessilis, altera pedicellata, singulæ ½–¾-pollicares, obcuneatæ, *spatha* aperta, oblonga, acuminata, ipsas æquante munitæ. *Bracteæ* plurimæ, oblongæ, longiuscule acuminatæ, coriaceæ, ferrugineæ. *Flos* unicus, stipite crasso, olivaceo, leviter sexlobato munitus. *Perianthium* æqualiter biseriale, sexglume, *glumis* oblongo-lanceolatis, membranaceis, ferrugineis, fructum vix æquantibus. *Fructus* breviter stipitatus, 1-locularis, oblongus, obtusus, osseus, fuscus, rugosus, punctis depressis majusculis notatus, ad apicem macula orbiculari flavida stylique unici vestigiis instructus. *Semen*....**

Readily distinguishable by its small stature, long pointed bracts, and the deep depressions on the fruit.

8. W. HUMILIS. **Culmis decumbentibus, erectis, simplicibus, filiformibus, compressiusculis; vaginis culmeis arcte convolutis, superne profunde hyalino-membranaceis, longiuscule filaceo-aristatis, aristis tortis; spiculis masculis 5–6, laxis, oblongis, erectis, in cymam linearem spiciformem, spathis apertis vaginiformibus deciduis interstinctam, remote disticheque dispositis; floribus remotiusculis; glumis 6, ciliiformibus, æqualibus, tortis: spiculis femineis solitariis (2–3?), cylindraceis, erectis, spathis vaginiformibus arcte convolutis suffultis; bracteis oblongis, lanceolatis; floris unici glumis 4 (6?) late ovatis, hyalinis; ovario oblongo, disco epigyno 4-lobato superato; stylo brevissimo; stigmatibus 2, longiusculis, exsertis.**

Willdenovia humilis, *N. ab E. MS. in herb. Sonder., absque descript.*

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, Cape Flats, *Ecklon*, 867!

Rhizoma **repens, crassitie pennæ gallinaceæ, *vaginis* approximatis, coriaceis, oblongis, obtusis, fuscis, sulcato-striatis (siccitate), mucronatis, ad margines membranaceis, dense obsitum. *Culmi* decumbentes, erecti, 1–1½-pedales, crassitie pennæ corvinæ, simplices, teretes v. compressiusculi, cinnamomei vel olivacei, purpureo maculati, impresso-punctulati. *Vaginæ culmeæ* 1–1½-pollicares, arcte convolutæ, coriaceæ, fuscæ, impresso-punctulatæ, ad margines præcipueque ad apices profunde hyalino-membranaceæ, aristatæ, aristis longiusculis, ciliiformibus, tortis. *Spiculæ masculæ* 4–6, oblongæ, erectæ, remotiusculæ, plurifloræ, in cymam simplicem, linearem, erectam, 2–3-pollicarem distiche dispositæ. *Rachis* communis complanata, sursum dilatata, ad margines subalata. *Spathæ*, ut videtur, deciduæ. *Flores* laxius-**

cule dispositi, singuli *bractea* membranacea oblongo-lanceolata ferruginea quam ipsi duplo triplove longiore suffulti. *Glumæ* 6, inter se æquales, ciliiformes, tortæ. *Stamina* 3; *filamenta* glumis vix angustiora; *antheræ* lineari-oblongæ, apiculatæ, dorso ferrugineæ.—Plantæ femineæ *culmi vaginæque* ut in mare. *Spiculæ* in apice culmi, solitariæ, erectæ, nunc 2–3, in cymam linearem distichaın remotiuscule dispositæ, singulæ cylindraceæ, pollicares, *spatha* vaginiformi arcte convoluta suffultæ. *Bracteæ* plurimæ, oblongo-lanceolatæ, mucronatæ, ferrugineæ, membranaceæ, omnes, unica excepta, steriles. *Flos* femineus unicus, sessilis, bractea stipante triplo brevior. *Perianthium* minutum, biseriale, 4-glume (an normaliter 6-glume?), *glumis* late ovatis, hyalinis. *Ovarium* stipiti crasso brevi impositum, oblongum, obtusum, superne *disco* epigyno, 4-lobato, lobis crassis ovatis crenulatis, munitum, 1-loculare, 1-ovulatum. *Ovulum* pendulum. *Stylus* brevissimus. *Stigmata* duo longiuscula, linearia, exserta, intus villosa. *Fructus* . . . .

Apparently a distinct species, easily recognizable by its slender unbranched stems, its simple inflorescence, the peculiar epigynous disk, &c., but possibly a depauperated form of some other species. In one male flower that I examined, there were six stamens; and in another instance one of the filaments divided above the middle into two branches, one of which bore an anther. In the only female flower that I have been able to examine, there were but 4 glumes to the female perianth.

Species mihi ignota.

W. COMPRESSA, *Thunb. Act. Holm.* 1790, t. 2. f. 3. An vere hujus generis?

Species excludendæ.

W. NEGLECTA, *Steud. Synop.* ii. 263 = W. striata, *Thunb.*

W. ? ECKLONII, *Kunth, Enum.* iii. 456 = W. striata, *Thunb.*

CERATOCARYUM, *Nees ab Esenb. in Lindl. Nat. Syst.* ed. 2. p. 451; *Kunth, Enum.* iii. p. 482.

1. C. ARGENTEUM, *Kunth, Enum.* iii. p. 483; *Steud. Synops.* ii. p. 264. —Restio (Elegia) argenteus, *Herb. Willd., fide Nees ab Esenb. Linnæa*, v. p. 656, *nec Thunb.*—Ceratocaryum speciosum, *N. ab E. MSS. in herb. Sonder. et Coll. S. Trinit. Dubl.*

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Eckl. et Zeyh.* 56. 5!

♂, *Burchell*, 7656!, 7905!

Plantæ femineæ, hactenus indescriptæ, *culmus vaginæque* ut in mare. *Panicula* terminalis, cymosa, lineari-oblonga, erecta, 2–4 poll. longa, pluristachya, *spathis* 3–4, convolutis, coriaceis, striatis, purpurascentibus, nitidis, demum deciduis munita. *Spiculæ* 1-floræ, breviter pedicellatæ, oblongo-pyramidatæ, 8–10 lin. longæ. *Bracteæ* laxiuscule imbricatæ, lanceolatæ, acutatæ, membranaceæ, flavescentes, nervo medio

prominente notatæ. *Flos* unicus, terminalis, bractea stipante multiplo brevior. *Perianthium* minutum, biseriale, 6-glume; *glumis* omnibus suborbiculatis, apice acutis, subcartilagineis, pallide ferrugineis, internis paulo minoribus. *Ovarium* ..... *Fructus* osseus, subglobosus, apice truncatus, indehiscens, 1-locularis, 1-spermus, ferrugineus vel basi spadiceus, 5–6 lin. longus, *stylis* duobus, diu persistentibus, divergentibus, intus dense stigmatoso-villosis coronatus.

2. C. FISTULOSUM, sp. n. Culmis fistulosis; spiculis masculis numerosissimis, plurifloris, in paniculam terminalem, cymosam, densam dispositis; bracteis glumisque lanceolatis acuminatis: spiculis femineis 4–6, in cymam linearem spiciformem dispositis, singulis pyramidatis, 1-floris; glumis minutis, oblongo-ovatis; fructu oblongo, tuberculato.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Burchell*, 7095!

Culmi 4–5-pedales, simplices, erecti, teretes, fistulosi, straminei, minutissime impresso-punctulati, crassitie pennæ olorinæ. *Vaginæ culmeæ* 1–2 poll. longæ, ellipticæ, acutæ, arcte convolutæ, coriaceæ, flavidæ, superne profunde membranaceæ, ad margines laceræ. *Panicula* mascula terminalis, laxiuscule cymosa, pluristachya, *spathis* vaginiformibus apertis, demum deciduis, munita. *Spiculæ* pluriflorae, oblongæ, erecto-patentes, 8–10 lin. longæ. *Bracteæ* oblongæ, angustatæ, longe acuminatæ, pallidæ, submembranaceæ, flores stipitulatos superantes. *Glumæ* 6, bracteis conformes, *internæ* 3 dimidio breviores. *Antheræ* inclusæ, lineari-oblongæ, apiculatæ, filamentis vix breviores. *Pistilli rudimentum* nullum.—*Spiculæ femineæ* 4–6, in cymam linearem spiciformem 2-3-pollicarem distiche dispositæ, singulæ pyramidatæ, pluribracteatæ, 1-floræ. *Bracteæ* membranaceæ, lanceolatæ, 1-nerviæ. *Perianthium* minutum, biseriale, sexglume; *glumis* subæqualibus, oblongo-ovatis, mucronatis, cartilagineis, ad margines superne membranaceis. *Ovarium* .... *Fructus* osseus, oblongus, tuberculatus, 1-locularis, 1-spermus, 4–5 lin. longus, basi perianthio persistente cinctus.

With almost the same habit and general appearance as the preceding species, *C. fistulosum* differs from it in its fistular stem, narrower bracts and glumes, and oblong tuberculated fruit. Burchell describes the spathes as "purpureis, marginibus membranaceis, ciliatis, dilute badiis."

ANTHOCHORTUS, *Nees*, *Lindl. Nat. Syst. Bot.* ed. 2. p. 451; *Kunth*, *Enum.* iii. p. 485; *Steud. Synops.* ii. p. 247.

Genus summopere dubium, plantis masculis hucusque tantum observatis. An vere Hypolænæ referendum?

1. A. ECKLONII, *Nees*, *Lindl. Nat. Syst.* ed. 2. p. 451; *Kunth*, *l. c.*; *Steudel*, *l. c.*, *nomen tantum*.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Eckl. et Zeyh.* 70. 10!

In the absence of female flowers it is impossible to judge

whether this be really separable from *Hypolæna*. The flowers are remote from each other along the side of the slender branches, somewhat in the same way as in the Australian genus *Calorophus*.

CRASPEDOLEPIS, *Steud. Synops. Glumac.* ii. p. 264.

1. C. FIMBRIATA, *Steud. l. c.*, ♀. **Species mihi ignota.**

RESTIO, vide *Journ. Linn. Soc* viii. p. 224.
(Addenda et Corrigenda.)

R. RHODOCOMA. Culmis erectis (tripedalibus), teretibus, ad vaginas subverticillatim ramulosis, ramulis erectis, gracilibus; vaginis culmeis arcte convolutis, superne laceris; vaginis rameis arctis, sub apice profunde hyalino bilobato mucronato-aristulatis; spiculis masculis 00, in paniculam amplam terminalem pluriramosam dispositis, singulis ovato-oblongis, parvis; bracteis arcte imbricatis; floribus oblongis, subtrigonis; glumis rigidis: spiculis femineis conformibus, nunc in apicibus ramulorum solitariis vel geminis, sed plerumque in cymas lineares distichas pluristachyas dispositis, singulis 1-floris; perianthio trigono, 6-glumi; glumis obtusis, rigidis, internis paulo latioribus; staminodiis 3-linearibus; ovario 3-loculari; stigmatibus 3, ferrugineo-villosis; capsula rigida, 3-loculari, 3-angulari, angulis salientibus dehiscente.—Rhodocoma Equisetum, *Nees ab Esenb. in Lindl. Nat. Syst.* ed. 2. p. 450; *Kunth, Enum.* iii. p. 480; *Steud. Synops.* ii. p. 248.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Burchell*, n. 3322!; *Drège*, 2016!; Zwartkopsrivier, distr. Uitenhage, *Eckl.* n. 788!
♂, Stellenbosch, *Mundt*!

Culmi erecti, tripedales et ultra, crassitie pennæ cygneæ, basi, spatio bi-, tripollicari, *vaginis* coriaceis, fuscis, lacerato-destructis, approximatis vestiti, superne remote vaginati, olivacei v. straminei, interdum nigro maculati, minutissime impresso-punctulati, supra medium ad vaginas subverticillatim ramulosi. *Ramuli* filiformes, compressiusculi, erecto-patentes, infimi steriles, supremi spiculigeri, sterilibus longiores. *Vaginæ culmeæ* pollicares et ultra, arcte convolutæ, ellipticæ, acuminatæ, coriaceæ, purpurascentes, striolatæ, ad margines profunde hyalino-membranaceæ, apice in aristam longam, tardius deciduam desinentes. *Vaginæ rameales* 3–4 lin. longæ, arcte coriaceæ, sub apice profunde bilobato, lobis hyalinis, aristulatæ, vel in ramulis sterilibus plus minus foliaceo-mucronatis. *Spiculæ masculæ* 00, in apice ramulorum verticillatorum in cymas lineares, simplices, pluristachyas, distichas dispositæ, nunc solitariæ vel geminæ, plerumque inflorescentiam magnam, 6–8-poll., oblongam, erectam efformantes, singulæ ovato-oblongæ, vix 2 lin. longæ, ¾ lin. latæ, pluriflloræ, axem flexuosam complanatam per margines respicientes, *spatha* oblonga, coriacea, superne profunde hyalina, longiuscule acuminato-aristata suffultæ.

Bracteæ arcte imbricatæ, oblongæ, coriaceæ, ferrugineæ, nitidæ, sub apice obtusato hyalino subulato-mucronatæ, flores oblongos subtrigonos vix superantes. *Glumæ externæ* oblongæ, obtusæ, rigidæ, fuscæ, *laterales* duæ naviculari-conduplicatæ, carinatæ, carina glabra; *glumæ internæ* 3, paulo breviores, tenuiores, conformes, laterales superne ad margines parum involutæ. *Filamenta* brevia. *Antheræ* lineari-oblongæ, apiculatæ, flavidæ, dorso ferrugineæ. *Pistilli* rudimentum nullum.—*Spiculæ bracteæque femineæ* masculinis conformes. *Flos unicus* terminalis, bracteam stipantem superans. *Perianthium* ut in mare, nisi glumis internis rigidioribus. *Staminodia* 3, liguliformia. *Ovarium* rotundatum, triloculare, *stylis* 3 incurvatis intus villoso-stigmatosis ferrugineis superatum. *Capsula* coriacea, triloba, 3-locularis, angulis salientibus longitudinaliter dehiscens. *Semina* magna, 3-gona.

In Dr. Sonder's herbarium are type specimens upon which Nees founded his genus *Rhodocoma*. A comparison of these specimens with other more perfect specimens leads to the conclusion that, as a genus, it is not distinct from *Restio*, to which, accordingly, I refer it. The species varies much in stature, and particularly in the number of spikelets on each branchlet: sometimes, as in the type specimens, there are but two, or even one only; but in most cases they are numerous, as above described.

R. HYSTRIX, sp. n. Culmis teretibus; vaginis arctis, longe aristatis; spiculis masculis cymoso-paniculatis, singulis cylindraceo-lanceolatis; bracteis arcte imbricatis, longe aristatis; glumis oblongo-lanceolatis; spiculis femineis cymoso-paniculatis, singulis plurifloris, oblongo-ovatis; capsula oblique ovata, compressa; stylo unico, brevi in stigmata duo ferrugineo-villosa diviso.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Burchell, sine numero.*

Culmi 3–4-pedales et ultra, erecti, teretes, straminei, impresso-punctulati, medio dichotome ramosi, *ramis* compressiusculis ascendentibus. *Vaginæ culmeæ* arcte convolutæ, 8–10 lin. longæ, coriaceæ, fuscæ, superne lacerato-membranaceæ, apice in aristam longam nigram desinentes. *Spiculæ masculæ* 00, in paniculam cymosam erectam dispositæ, singulæ plurifloræ, cylindraceo-lanceolatæ, 3–4 lin. longæ. *Bracteæ* arcte imbricatæ, oblongæ, coriaceæ, fuscæ, superne membranaceæ, sub apice longe aristatæ (aristis nigris, erectis), flores lanceolatos complanatos pedicellatos vix duplo superantes. *Glumæ* rigidiusculæ, oblongo-lanceolatæ; *externæ laterales* duæ naviculari-conduplicatæ, villoso-carinatæ; *internæ* tenuiores, breviores, planiusculæ. *Antheræ* lineares, apiculatæ, flavidæ, dorso ferrugineæ, filamenta albida linearia vix superantes.—*Spiculæ femineæ* 00, in paniculam cymosam parce diffusam dispositæ, singulæ oblongo-ovatæ, 8–10 lin. longæ, 4–5 lin. latæ, erectæ, plurifloræ, basi *spatha* vaginiformi suffultæ. *Bracteæ glumæque* ut in mare nisi magnitudine majores.

Ovarium ..... *Capsula* oblique ovata, compressa, abortu 1-locularis, margine longitudinaliter dehiscens, perianthio persistente cincta. *Stylus* brevis, in *stigmata* duo ferrugineo-villosa, exserta divisus.

This apparently very distinct species does not seem to have been met with by any other traveller than Burchell; at any rate, I have met with no specimens other than those collected by him.

R. QUADRATUS, sp. n. Culmis elatis, tetragonis, fasciculatim ramosissimis; ramis dimorphis, his fertilibus, illis sterilibus; vaginis culmeis pollicaribus et ultra, arctis, acuminatis, laceris; vaginis rameis plus minus foliaceo-mucronatis; spiculis masculis parvis, ovato-oblongis, paniculatis; bracteis arcte imbricatis, oblongo-acutis, mucronatis; glumis oblongis: spiculis femineis cymoso-paniculatis, singulis ovato-oblongis, demum cuneatis, plurifloris; staminodiis liguliformibus; ovario triloculari; stigmatibus 3, capsula triloba.—Restio tetragonus β. exaltatus, *N. ab E. in Sonder, pro parte, quoad plantam masculam.*

Variat culmis, ramis vaginisque vegetioribus, necnon mucronibus foliaceo-subulatis.

Hab. Pr. B. Sp. Ex. sp. s. ♂, *Burchell,* 408!, 7778!; Uitenhage, *Zeyher,* 540!; Table Mount., *Ecklon!, Drège,* 167 a!

♀, ? *Ecklon,* 166, *pro parte!, Dr. Pappe,* 96, *in herb. Hook.*!; *Niven, in herb. Mus. Brit.*!

Culmus erectus, 4–5-pedalis, crassitie pennæ anserinæ et ultra, tetragonus, olivaceus, punctulatus, dichotome ramosus, *ramique* fasciculatim vel subverticillatim ramosissimi, spiculigeri, quam steriles longiores. *Vaginæ culmeæ* arcte convolutæ, pollicares, ellipticæ, coriaceæ, fuscæ, nervoso-striatæ, superne ad margines laceratæ. *Vaginæ ramulorum* parvæ, coriaceæ, albo-lepidotæ, superne sub apice profunde hyalino bilobato foliaceo-mucronatæ, mucrone arcuato. *Spiculæ masculæ* in paniculas parce ramosas terminales remotiuscule dispositæ, singulæ pluriflore, ovato-oblongæ v. demum cuneatæ, 2 lin. longæ, 1 lin. latæ, *spatha* vaginiformi, spiculam ipsam vix æquante, tectæ. *Bracteæ* undique arcte imbricatæ, oblongo-acutæ, subcoriaceæ, ferrugineæ, sub apice acutiusculo, membranaceo, brevissime mucronatæ, *flores* oblongos stipitulatos compressiusculos superantes. *Glumæ* oblongæ, *externæ* coriaceæ, cymbiformes, *laterales* duæ naviculari-conduplicatæ, carinatæ, carina glabra; *glumæ internæ* conformes, breviores, planiusculæ, membranaceæ. *Antheræ* oblongæ, apiculatæ, flavidæ, dorso ferrugineæ, *filamentis* albidis liguliformibus breviores. *Pistilli rudimentum* tristylum vel nullum.—*Spiculæ femineæ* cymoso-paniculatæ, singulæ erectæ, oblongo-ovatæ, demum obcuneatæ, pluriflore, 2 lin. longæ, 2 lin. latæ. *Bracteæ,* quoad formam, ut in mare *floribusque* oblongis, subtrigonis, brevissime stipitulatis, brevioribus vel raro longioribus. *Glumæ* ut in planta mascula. *Staminodia* 3, liguliformia. *Ovarium* trilobatum,

triloculare, castaneum, *stigmatibus* 3 villoso-plumosis superatum. *Capsula* magis minusve triloba, abortu bi- vel unilocularis, stylorum vestigiis coronatum, perianthio persistente vix brevior.

This species seems variable in the size of all its parts. Usually it has sterile much-branched foliaceous culms, separate from, and shorter than the fertile culms, which latter are destitute of leaves, and bear comparatively large spikelets in slightly branched panicled cymes; but not unfrequently spikelets are borne on the end of leafy much-branched culms, like those that are ordinarily sterile; and in this case the spikelets, though perfect, are smaller than those borne on the true fertile stems. This species is apt to be confounded, on a first glance, with *Leptocarpus paniculatus*, from which, however, it is very distinct.

R. BIFARIUS, sp. n. Culmis teretibus; paniculis masculis laxis pluristachyis; spiculis oblongis, obtusis, compressis; bracteis bifariam imbricatis; spiculis femineis majoribus, ovatis, plurifloris; bracteis quinquefariam imbricatis; stylis 3; capsula abortu biloculari.

Hab. Pr. B. Sp. Ex. sp. s. ♂ et ♀, *Burchell*, 8068!

Culmi 4-pedales, teretes, simplices, solidi, olivacei, albo-lepidoti, crassitie pennæ gallinaceæ. *Vaginæ culmeæ* ½-pollicares, arctæ, elliplipticæ, coriaceæ, fuscæ, striatæ, superne ad margines tenuiores, sub apice obtusiusculo subulato-mucronatæ. *Panicula* mascula cymosa, effusa, pluriramosa, ramis complanatis, sursum dilatatis, erecto-patentibus. *Spiculæ* oblongo-obtusæ, vel cylindraceæ, subcompressæ, plurifloræ, 1 poll. longæ, 3–4 lin. latæ. *Spathæ* bracteiformes. *Bracteæ* distiche dispositæ, basi arcte, superne laxe imbricatæ singulæ oblongæ, recurvatæ, coriaceæ, spadiceæ, impresso-punctulatæ, ad margines tenuiores, ad apicem breviter mucronatæ, flores 3-plo superantes. *Flores* stipitulati, oblongi, obtusi, arcuati. *Glumæ* oblongæ, acutæ, *laterales externæ* naviculari-conduplicatæ, villoso-carinatæ, ferrugineæ, rigidæ; *intermedia antica*, æqualis, planiuscula; *internæ* 3, breviores, tenuiores, conformes. *Antheræ* inclusæ, lineari-oblongæ, dorso ferrugineæ, antice flavidæ. *Pistilli* rudimentum nullum.—*Spiculæ femineæ* 1-3, terminales, erectæ, oblongo-ovatæ, 1-2-pollicares, eas *Thamnochorti imbricati* (*Staberohæ imbricatæ*, Kunth) referentes. *Bracteæ* oblongæ, mucronatæ, nervoso-striatæ, flores 3–4-plo superantes. *Glumæ* ut in mare. *Ovarium* 3-loculare, *stylis* 3 stigmatosis recurvis superatum. *Capsula* biloba, abortu bilocularis, dehiscens, glumis persistentibus vix brevior.

The female plant is so precisely like a *Thamnochortus* (§ *Staberoha*) in general appearance, that it would be passed as belonging to that genus by any one who did not examine the structure of the flower, which is that of a true *Restio*. It is one of the most distinct of that genus.

R. LEPTOCLADOS, *Mast. Journ. Linn. Soc.* viii. p. 241, *ubi stirps feminea tantum descripta.*

Plantæ masculæ a cl. Burchellio lectæ (herb. n. 5652!) *culmus vaginæque* ut in feminea. *Spicula* in apice culmi, solitaria, erecta, oblonga, compressa, pluriflora, 1½–2 lin. longa, basi *spatha* brevi vaginiformi suffulta. *Bracteæ* oblongo-acutæ, coriaceæ, ferrugineæ, sub apice tenuiore subulato-mucronatæ, *flores* oblongos duplo superantes. *Glumæ externæ* oblongæ, rigidiusculæ, ferrugineæ, naviculari-conduplicatæ; *internæ* 3, oblongæ, breviores, hyalinæ. *Antheræ* inclusæ, apiculatæ, flavidæ.

R. FERRUGINOSUS, *Journ. Linn. Soc.* viii. p. 226, adde ♂, *Burchell*, 7632!

R. SUBVERTICILLATUS, *l. c.* p. 227, adde ♂, *Burchell*, 8112!

R. TRIFLORUS, *l. c.* p. 234, adde ♂, *Burchell*, 853!, 6800!, 7926!, 8017!

R. SIEBERI, *l. c.* p. 235, adde ♀?, *Burchell*, 3499!

R.? DIVARICATUS, *Mast. l. c.* p. 236,=R. macer; ♀, *Burchell*, 7520!

R.? PUNCTULATUS, *Mast. l. c.* p. 242,=Thamnochortus distichus.

R. DISTICHUS, *l. c.* p. 243,=Thamnochortus distichus.

R. TRITICEUS, *l. c.* p. 243, adde ♂ et ♀, *Burchell*, 8005!

R. IMPOLITUS, *l. c.* p. 249,=*Hypolæna impolita.*

R. PERPLEXUS, *l. c.* p. 253, adde ♂, *Burchell*, forma gracilis, 7430!; ♀, *Burchell*, 641!

R. BIFIDUS, *l. c.* p. 253, adde ♀, *Burchell*, 7647!

R. ELONGATUS, *Thunb. l. c.* p. 254,=Thamnochortus elongatus.

R. GLOMERATUS, *Thunb.*=forma monstrosa, bracteas steriles in spicas glomerulosve aggregatas exhibens.

EXPLANATION OF PLATES VII. & VIII.

PLATE VII.

A. *Hypolæna Eckloniana.* 1, portion of female plant; 2, ditto of male; 3, male flower; 4, one of the glumes of the same; 5, female flower; 6, ovary; 7, transverse section of ovary.

B. *Dovea mucronata.* 1, inflorescence, &c. of female plant; 2, ditto of male plant; 3, male flower; 4, inner glume and stamen; 5, female flower; 6, ripe fruit; 7, vertical section of same; 8, seed.

C. *Hypodiscus synchroolepis.* 1, inflorescence of female plant; 2, inflorescence of male plant; 3, male flower; 4, stamen; 5, female flower; 6, vertical section of ovary.

PLATE VIII.

D. *Willdenovia Lucæana.* 1, inflorescence of male plant; 2, portion of sterile culm; 3, inflorescence of female plant; 4, male flower and bract; 5, fruit, showing the lobed fleshy stipes and a portion of the minute perianth.

E. *Ceratocaryum fistulosum*, Mast. 1, inflorescence of male plant; 2, inflorescence of female plant; 3, the same with the bracts partially removed; 4, male flower of same; 5, stamen, from the front; 6, the same, from behind; 7, ovary with perianth; 8, transverse section of ovary.

Fungi Cubenses (*Hymenomycetes*). By the Rev. M. J. Berkeley, M.A., F.L.S., and Dr. M. A. Curtis.

[Read May 2, 1867.]

The following account of the Hymenomycetous Fungi of Cuba, which it is hoped will be shortly followed by the remaining tribes, has been drawn up partly from the list given by the late Dr. Montagne in the great work on Cuba by Ramon de la Sagra, assisted in most cases by authentic specimens, and partly from two large collections (consisting of more than 1600 numbers) made by Mr. Charles Wright in the island. The Hymenomycetes described by Dr. Montagne, however, amount only to 59 species, while the present enumeration comprises 490 species, besides some marked varieties. Fourteen only of Dr. Montagne's species do not exist in either of Mr. Wright's collections.

As points of comparison, we have had at our disposal:—a complete set of Mr. Spruce's fungi collected in the countries bordering on the River Amazon; a large quantity of Leprieur's Guiana Fungi, which have, however, in many cases, entirely lost their colour from having been steeped previously to drying in some antiseptic fluid; numerous species from Central America and Mexico, forwarded by Professor Fries; the Brazilian collections of Gardner; and, above all, enormous quantities of the fungi of the United States, especially the more Southern, amounting to above 6470 numbers. The latter, in many cases, were accompanied by copious notes or detailed descriptions, aided by excellent figures. Dr. Montagne, it should be observed, had also a few notes to guide him; or characters of the Guiana species could not have been drawn up satisfactorily.

As regards the species from Cuba, we have, in many cases, had the assistance of excellent notes, including frequently the colour of the spores, which is of such great importance in the genus *Agaricus*, and is often a considerable help in other genera.

The three principal genera in the present list of Cuban Hymenomycetes are *Agaricus*, *Marasmius*, and *Polyporus*, which are represented severally by 82, 51, and 120 species, amounting to more than half the entire number. Of the 490 species, about * 57 per cent. are peculiar to the island, 13 per cent. are widely-

* The exact numbers are 57·0055, 13·9593, 12·0474, 3·0271, and 13·0292, amounting altogether to 99·0685.

dispersed species; 12 per cent. are common to the island and Central America, together with the warmer parts of South America and Mexico; 3 per cent. are common to it with the United States, especially the more southern; while 13 per cent. are European species, including, however, 13 which may be considered cosmopolitan. Some common tropical species, as *Polyporus xanthopus* and *Hexagonia tenuis*, do not occur in the collections; and on the whole the general character seems subtropical rather than tropical. Many of the species, however, are decidedly those of temperate regions, or, at least, nearly allied. In the pine-forests we have such species as *Polyporus pinicola*, *P. Schweinitzii*, and *P. annosus*, which call to mind the Fungi of our own country or Northern Europe, while *Hydnum hirneoloides* replaces *H. gelatinosum*. Unfortunately, though the date at which they were gathered often accompanies the specimens, there is no indication of the respective altitudes, which would enable us to judge more accurately as regards the distinctive characters of the Fungal flora.

The months in which Hymenomycetes abound most in Cuba are December, January, and May; next to these in order are February, October, and November, the fewest occurring in April and September. Species, however, occur at all times of the year, though there are five times as few in September, which is the least prolific month, as in December, which is the most so. The hottest months are July and August, and the coldest December and January, which yield the greatest number of species, though not much more numerous than in May. Though the climate in general is hot and dry during the greater part of the year, rain occasionally falls in torrents from July to September; but the moisture is not sustained with sufficient uniformity to be very productive; for, as a general rule, the times of greatest rain are usually those in which the most Fungi appear, though this is not without exceptions. The occasional showers which fall before July and after September account for the large number of species in May, and the excess in October and November above the numbers in the less prolific months; while it is to be observed that in the colder months, which are so productive, the depression of the thermometer so low as 50° or 53° is rare, while in summer it does not rise above 82° or 86° *, and in the highlands it is probably much lower, except in some confined spots. The mean temperature of December and January, in which the number of species

* The meteorological details are taken from the 'Imperial Gazetteer.'

is greatest, is 69°·8. We have no particulars, beyond the occurrence of occasional showers, to account for the large number of species which is found in May. The fact that the climate is, on the whole, more temperate than that of some other islands in the same latitudes would lead us to expect the presence of a comparatively large number of European species, or those which are found in the more northern United States or British North America, and may account for the fact that so small a proportion of species should be identical with those from neighbouring islands. We do not expect the same rule to prevail as to the character of an insular mycology as in an insular flora; and it is possible that the disproportion might vanish if the other West-Indian islands had been as diligently explored.

Our observations are founded, indeed, on only a little more than half the species, no dates being given with the others. One species, *Agaricus bombycinus*, a species which occurs both in Europe and America, is marked as coming from Valparaiso, but whether from a district in Cuba so called, or not, we have no information.

Perhaps the most interesting species are those which occur in the genera *Craterellus* and *Laschia*, the latter genus especially yielding several new forms. We have found it necessary to propose a new genus, *Grammothele*, for a group of curious but rather obscure species, while *Michenera*, with which we have long been acquainted as occurring in the United States, is peculiarly interesting in point of structure. *Hymenochaete velutiiceps* is an entirely new form in the genus, with no immediate ally.

We reserve a general comparison with the mycology of other countries till we have examined the remainder of the collections, which, though extensive, do not amount to the same number as those now laid before the Society, nor can they boast of the great prevalence of curious forms which characterized the analogous part of the collections made by Leprieur in Cayenne.

The habitats appended to species already described are taken from specimens in our herbaria or such as have passed through our hands, but do not profess to be at all perfect.

1. Agaricus, *L.*

1. A. (Amanita) Cubensis, *B. & C.* (58.) Pileo spadiceo, verrucis obscurioribus notato, margine esulcato; stipite exannulato, basi incrassato, fibrilloso; lamellis latis, distantibus.

Pileus 1½–2 inches across; spores obovate, $\frac{1}{1250}$ to $\frac{1}{1500}$ inch long. Allied to *A. gemmatus*.

2. A. (LEPIOTA) HEMISCLERUS, *B. & C.* (57, 190.) **Pileo e convexo plano, glabro, verrucis conicis nigris rigidis exasperato, pallide fusco, margine excedente; stipite deorsum incrassato, glabro, intus flocceso, sursum albo, deorsum pileo concolore, annulo amplo reflexo; lamellis liberis niveis angustis remotis.**

On logs in woods. Pileus 2–3 inches broad, stem 2 inches high. The pileus, when dry, is fawn-coloured, and sometimes prettily clouded; the warts are so rigid that they are quite sunk into the substance when dry. There are sometimes a few obscure warts on the stem where the edge of the pileus is attached. A very noble species. Spores narrow oblong.

3. A. (LEPIOTA) CLYPEOLARIUS, *Bull.* (2, 112, 116.)

On stumps. June. *Hab.* New Zealand, United States, Europe. No. 112 is a yellowish variety, no. 116 white. Spores broad.

4. A. (LEPIOTA) SORDESCENS, *B. & C.* (24, 71.) **Pileo tenui, centro fusco, margine gradatim candido, striato sericeo; lamellis angustis, primum albis, remotis; stipite gracili glabro albo, sicco fuscescente.**

On logs in woods. December. Pileus an inch or more across: stem 1½ inch high, 1 line thick. Mycelium ample, white, consisting of threads spreading out into a membrane on the matrix.

5. A. (LEPIOTA) CHEIMONOCEPS, *B. & C.* (129.) **Niveus; pileo tenui pulverulento hic illic appendiculato; stipite deorsum incrassato furfuraceo, annulo lacerato; lamellis remotis latioribus.**

On logs. November. Pileus 1–1½ inch across; stem 1–1½ inch high. A very pretty species.

6. A. (LEPIOTA) FLORALIS, *B. & Rav. Annals of Nat. Hist.* Dec. 1853. (1.)

On the ground. *Hab.* South Carolina. Pileus a few lines across. Spores subfusiform, $\frac{1}{3500}$ inch long.

7. A. (LEPIOTA) SUBCLYPEOLARIUS, *B. & C.* (131.) **Pileo ex ovali plano tenui radiato-striato flocceso squamoso albo, umbone fusco; lamellis distantibus remotis liberis; stipite subæquali glabro albo, annulo medio.**

On roots of trees or dead wood. Pileus 1½ inch across; stem 1½ inch high. Spores minute, elliptic.

8. A. (ARMILLARIA) MELLEO-RUBENS, *B. & C.* (45, 48, 60.) **Cæspitosus; pileo tenui glabro striato subcoriaceo; stipite solido sursum deorsumque leviter incrassato pulverulento, annulo apicali; lamellis latis adnato-decurrentibus, albis roseo tinctis.**

In hollow trees and on logs. August, December. Pileus 1–2 inches across; stem 1½ inch high, ¼ inch thick; spores white, subglobose. Allied to *A. melleus*. Pileus pale brown, shaded to pink on the edge.

9. A. (ARMILLARIA) CHEIMONOPHYLLUS, *B.* & *C.* (11.) Pileo e convexo plano glabro, squamis brunneis planis notato, crassiusculo; stipite solido sursum leviter incrassato glabro; lamellis latis distantibus liberis crassis albis.

On logs. May. Pileus 1½ inch across; stem 1 inch high. Nearly allied to *A. mucidus*.

10. A. (CLITOCYBE) RUBRO-TINCTUS, *B.* & *C.* (89.) Pileo umbilicato glabro rubro; stipite elongato glabro subæquali concolore cavo; lamellis tenuibus latis decurrentibus pallidioribus.

On earth in woods. June. Pileus ½–1 inch across; stem 2 inches high. Allied to *A. laccatus*, but with thinner and more crowded gills.

11. A. (CLITOCYBE) LACCATUS, *Scop. Fr. Ep.* p. 79. (58, 62.)

In dense woods. August. *Hab.* Tasmania, United States, Europe.

12. A. (CLITOCYBE) HOLOPORPHYRUS, *B.* & *C.* (5.) Pileo tenui plano glabro radiato sulcato reticulato sordide purpureo; stipite glabro cavo pallide purpureo; lamellis distantibus adnatis stipite concoloribus, interstitiis transverse rugosis.

On rotten logs in woods. September. Pileus 2–2½ inches across; stem 2 inches high, ¼ inch thick. Spores oblong, not subglobose as in *A. laccatus*. No. 95 is a distinct species, belonging to the same group; but I cannot define it from a single specimen without notes.

13. A. (COLLYBIA) RUBICOLOR, *B.* (57, 18, 19, 34, 61.) *Ann. of Nat. Hist.* vol. iii. p. 376.

On sticks in thick woods, and on logs. March, April. *Hab.* Brazil, Venezuela.

14. A. (COLLYBIA) CARECOMOEIS, *B.* & *C.* (132.) Pileo candido campanulato, squamis adpressis amplis rufulis ornato; stipite sursum albo, deorsum incrassato fuscidulo opaco; lamellis latis ventricosis candidis.

On dead leaves &c.

15. A. (COLLYBIA) STIPITARIUS, *Bull. Fr. Ep.* p. 87. (14, 46.)

On dead leaves and rotten logs. May. *Hab.* Venezuela, Pennsylvania, Europe.

16. A. (COLLYBIA) STUPPARIUS, *B. & C.* (2, 75.) Pileo e convexo plano subcostato tenui subpellucido pallide fusco stuppeo; stipite gracili concolore pilis subfasciculatis hispido; lamellis angustis liberis subdistantibus.

On sticks in thick woods. December. Pileus 1 line across; stem 1/3 inch high. When young it appears under the form of a white orbicular disk. Like *A. stipitarius* it is allied to the *Marasmei*.

17. A. (COLLYBIA) NIGRITA, *B. & C.* (51.) Niger; pileo convexo pulverulento, margine involuto; stipite elongato fibrilloso; lamellis angustis confertis attingentibus.

On dead wood. Pileus 1/4–1/3 inch across; stem 1/2–1 1/4 inch high, 1 line thick.

18. A. (COLLYBIA) HEMILEUCUS, *B. & C.* (59.) Pileo plano orbiculari fusco; stipite concolore pulverulento; lamellis breviter adnatis confertis albis.

Amongst dead leaves. Allied to *A. confluens*. Pileus 3/4 inch across; stem 2 inches high, 1 line thick. Subcespitose.

19. A. (COLLYBIA) BORYANUS, *Berk. & Mont. Syll.* p. 108. (28, 47.)

On dead wood. *Hab.* Brazil. The Cuban specimens are darker when dry, and the gills a little more remote.

20. A. (MYCENA) RORIDULUS, *B. & C.* (55.) Pileo e convexo plano tenero albido viscido, umbone fusco; stipite æquali fistuloso glabro subfusco; lamellis adnatis puberulis latiusculis albis, interstitiis subtrabeculatis.

On rotten wood. October. Pileus 1/4 inch across; stem 1 inch high, 1/3 line thick.

21. A. (MYCENA) EUSPEIREUS, *B. & C.* (26, 29, 73.) Pileo e convexo plano tenui pallide fusco striato; stipite concolore basi strigoso glabro sursum dilatato; lamellis distantibus decurrentibus latis albis.

On logs in woods. December. Pileus 1 inch across: stem 1 1/4 inch high. Scattered or cespitose. Allied to *A. speireus*.

22. A. (MYCENA) HYEMALIS, *Osb. Fr. Ep.* p. 119; *Mont. Cub.* p. 420.

On mossy bark.

23. A. (MYCENA) CITRICOLOR, *B. & C.* (15.) Pusillus, tener; pileo convexo pellucido citrino; stipite glabro, lamellisque paucis decurrentibus concoloribus.

On dead leaves. Gregarious. Pileus 2 lines across; stem 1/4 inch high, filiform.

24. A. (MYCENA) ACICULA, *Schæff.* t. 222. (459.)

On dead leaves. *Hab.* Upper Carolina, Europe.

25. A. (MYCENA) TENERRIMUS, *Berk. Outl.* p. 129. (16.)

On dead sticks. *Hab.* Europe.

26. A. (OMPHALIA) SANGUINEUS, *B. & C.* (91.) **Sanguineus; pileo infundibuliformi tenui pruinoso; stipite sursum dilatato; lamellis confertis angustis decurrentibus.**

On rotten wood. Pileus ½ inch across; stem ½ inch high. A beautiful species, belonging to the same section as *A. scyphoides*.

27. A. (OMPHALIA) KERMESINUS, *B. & C.* (32.) **Pileo convexo umbilicato glabro; stipite sursum dilatato glabro; lamellis paucis latis decurrentibus.**

On rotten wood. "Deep carmine." Pileus ¼ inch across; stem ¾ inch high. Allied to *A. tricolor*.

28. A. (OMPHALIA) SUBPELLUCIDUS, *B. & C.* (9.) **Fascicularis; pileo subumbilicato convexo tenui sulcato glabro albido; stipite cavo pellucido glabro; lamellis distantibus adnato-decurrentibus albidis.**

On rotten logs in woods. August. Pileus ½ inch across; stem 1¼–1 inch high.

29. A. (OMPHALIA) ANTHICEPS, *B. & C.* (110.) **Dense cæspitosus albus; pileo profunde umbilicato glabro, margine depresso iterumque elevato, centro subfusco; stipite glabro cavo; lamellis paucis adnato-decurrentibus.**

On old logs in woods. January.

30. A. (OMPHALIA) CHONDRIPES, *B. & C.* (11.) **Umbrinus, pusillus; pileo depresso, margine involuto; stipite cartilagineo farinaceo; lamellis paucis arcuatis decurrentibus.**

Apparently on some decayed fruit. Pileus 1½ line across; stem ¼–⅓ inch high, ½ line thick, rather stout for the size of the pileus.

31. A. (OMPHALIA) FLAVELLUS, *B. & C.* (141.) **Sulphureus; pileo convexo tenui glabro striato; stipite capillari sursum dilatato puberulo; lamellis paucis distantibus decurrentibus.**

On sticks in woods. August.

32. A. (OMPHALIA) CENTENARIUS, *B. & C. Ann. of Nat. Hist. Dec.* 1853. (136, *Curt.* 2888.)

In dense bunches on logs in woods. July. *Hab.* South Carolina.

33. A. (OMPHALIA) CAMPANELLA, *Batsch, Fr. Ep.* p. 126. (144.)

Underside of rotten logs in woods. June. *Hab.* Xalapa, River Amazon, Southern and Northern United States, Europe.

The Xalapa and Cuban specimens are more gregarious than usual; but we have specimens from Upsal exactly intermediate.

34. A. (OMPHALIA) FIBULA, *Bull. Fr. Ep.* p. 127. (20, 36.)

Among *Hepaticæ* on banks. February. *Hab.* Australia (Bugle Range, Swan River), United States, Europe.

35. A. (PLEUROTUS) CÆSPITOSUS, *B. & C.*—Lentinus cæspitosus, *B. Hook. Lond. J.* vol. 6. p. 317. (1, 66, 118, 134, 176.)

In large bunches on logs. May. *Hab.* South Carolina, Ohio. Nos. 66, 184, 176 are a scattered variety on logs in woods, and on dead trees in forests. December, January, March. Mr. Ravenel has found 160 individuals in a single cluster. Dr. Curtis states that this is certainly an Agaric.

36. A. (PLEUROTUS) COMMISCIBILIS, *B. & C.* (45, 46, 13.) Albus; pileo excentrico plano vel depresso subsulcato; stipite sursum dilatato; lamellis longe decurrentibus tenuibus latiusculis.

On logs in woods. May. Pileus 1½ inch across; stem ½–¾ inch high.

37. A. (PLEUROTUS) CAVEATUS, *B. & C.* (38, 124, 125, 126.) Pileo albo vel pallide fusco infundibuliformi, leviter striato; stipite solido glabro excentrico; lamellis albis vel albidis decurrentibus.

On rotten logs. January, December. Pileus 2 inches across; stem 1½–2 inches high. Gregarious or cespitose. Nearly allied to the last, but the pileus much more depressed.

38. A. (PLEUROTUS) EXCAVATUS, *B. & C.* (37.) Pileo excentrico depresso primum subzonato pulverulento; stipite sursum deorsumque incrassato e mycelio filamentoso oriundo; lamellis confertissimis angustis adnato-decurrentibus.

On rotten wood. "Spores white." Pileus ¾ inch across; stem ½ inch high, 1 line thick.

39. A. (PLEUROTUS) PUTREDINIS, *B. & C.* (60.) Cæspitosus; pileo excentrico subspathulato glabro; stipite elongato fibrilloso sursum dilatato; lamellis angustis decurrentibus.

On dead wood. Pileus 2–3 lines across; stem ½ inch high, scarcely a line thick. Densely cespitose. Apparently white. A very curious species.

40. A. (PLEUROTUS) FUSCIFRONS, *B. & C.* (24, 135.) Pileo plano tenui molli glabro e fusco nigrescente; stipite laterali vel sublaterali; lamellis latiusculis adnato-decurrentibus subfuscis.

On dead wood. January. Pileus ½–1 inch across; stem ⅓–½ inch high. Subcespitose or scattered.

41. A. (PLEUROTUS) HEMIPHLEBIUS, *B. & C.* (49.) Pileo flabelliformi glaberrimo tenui; stipite brevissimo pruinoso cylindrico; lamellis valde distantibus tenuibus acutis, interstitiis phlebophoris.

On dead wood. Pileus 1½ inch across, rufous when dry.

42. A. (PLEUROTUS) SEMITECTUS, *B. & C.* (113.) Pileo ex albo pallide fusco spongioso-pubescente demum glabro flabelliformi; stipite brevissimo vel obsoleto, lamellisque confertissimis angustis subdecurrentibus pileo concoloribus.

On logs in dense woods. June. Pileus 1–2 inches across, sometimes lobed. Allied to *A. algidus*. *Hab.* Venezuela.

43. A. (PLEUROTUS) BARBATULUS, *B. & C. Ann. of Nat. Hist.* Oct. 1859. (44, *Curt.* no. 6390.) Pileo reniformi pallido spongioso-hispidulo; stipite nullo; lamellis distantibus tenuibus; interstitiis lævibus.

On decayed wood. *Hab.* Boston, United States. Pileus 1¼ inch across. Allied to *A. atrocæruleus*.

44. A. (PLEUROTUS) ATROCÆRULEUS, *Fr. Ep.* p. 137. (39.)

On dead wood. *Hab.* (Swan River) California, South Carolina, Pennsylvania, Europe.

45. A. (PLEUROTUS) FLAVO-LANATUS, *B. & C.* (143.) Pileo primum resupinato spongioso-tomentoso luteo-fusco; stipite nullo; lamellis subdistantibus flavis, interstitiis lævibus.

On sticks. January. "Spores white." Pileus 1 inch across.

46. A. (PLEUROTUS) HÆDINUS, *B. & C.* (43.) Albus; pileo suborbiculari flabellato spathulatoque opaco; stipite nullo; lamellis subventricosis pallidis, acie albo-pruinosis.

On dead wood. Pileus 3–5 lines across, sometimes slightly lobed; surface resembling kid leather.

47. A. (PLEUROTUS) SUBBARBATUS, *B. & C.* (808.) Atro-fuscus; pileo flabelliformi subtiliter hispido striatulo, margine undulato; stipite nullo; lamellis concoloribus angustis.

On rotten logs. May. Pileus ⅓ inch across.

48. A. (PLEUROTUS) APPLICATUS, *Batsch*, f. 125; *Fr. Ep.* p. 137. (41, 16, 52.)

On logs. May. "Spores white." *Hab.* Swan River, Tasmania, Juan Fernandez, Northern and Southern United States, Europe. No. 52 is on tree ferns.

49. A. (PLEUROTUS) ELATINUS, *P. Myc. Eur.* vol. 3. p. 18. (98.)

On bark. October.

50. A. (VOLVARIA) BOMBYCINUS, *Schæff.* t. 98; *Fr. Ep.* p. 138. (63.)

On decayed wood, "Los Hondones (Valparaiso). October 18."
Hab. Southern and Northern United States, Europe.

51. A. (Pluteus) æthalus, *B. & C.* (50.) Pusillus; pileo circa umbonem depresso spadiceo pulverulento; stipite gracili concolore; lamellis latis.

On rotten wood. Pileus $\frac{1}{8}$ inch across; stem $\frac{1}{2}$ inch high, $\frac{1}{3}$ line thick; spores globose, $\frac{1}{4500}$ inch in diameter.

52. A. (Pluteus) tephrostictus. *B. & C.* (51.) Pileo umbonato albo, pilis mollibus glandulosis nigris vestito; stipite deorsum incrassato albo, parce glanduloso; lamellis ex albo pallide carneis.

On underside of old logs. May. Pileus $\frac{1}{2}$ inch across; stem $\frac{1}{2}$ inch high, 1 line thick. Spores globose.

53. A. (Pluteus) lætifrons, *B. & C.* (94.) Pusillus; pileo e conico plano glabro radiato-striato aurantio-rubro; stipite gracili glabro deorsum leviter incrassato rubro; lamellis latis luteis.

On rotten wood. April. Pileus $\frac{1}{8}$–$\frac{1}{2}$ inch across; stem 1 inch high, $\frac{1}{2}$ line thick. Spores globose.

54. A. (Leptonia) hypoporphyrus, *B. & C.* (17.) Pileo tenui glabro nitido depresso striato fusco; stipite gracili elongato, sursum dilatato, subfusco; lamellis latis livido-purpureis.

On earth in woods. April. Pileus 1 inch across; stem $1\frac{1}{2}$ inch high, $\frac{3}{8}$ line thick.

55. A. (Nolanea) Babingtonii, *Bloxam, Berk. Outl.* p. 148. (31.)
On the ground amongst leaves. *Hab.* England, Pennsylvania.

56. A. (Eccilia) rhodocalyx, *Lasch. Fr. Ep.* p. 160. (43.)
On the ground. *Hab.* Europe.

57. A. (Pholiota) scobifer, *B. & C.* (76.) Cæspitosus, fulvus; pileo conico farinaceo, squamis acutis aspero; stipite deorsum incrassato, pilis fasciculatis patentibus vestito.

About the roots of trees. January. A fine species, of which young specimens only have been gathered. Allied to *A. flammans*.

58. A. (Flammula) penetrans, *Fr. Ep.* p. 189. (52.)
On dead trees. *Hab.* Australia (Clarence River), United States, Europe.

59. A. (Flammula) sapineus, *Fr. Ep.* p. 189. (53, 55, 23.)
On dead trees. May. *Hab.* Simla, Venezuela, New Zealand, South Carolina, Europe.

60. A. (Flammula) aureo-brunneus, *B. & C.* (64.) Pileo ad-

presso-fibroso tenui aureo, margine inflexo; stipite solido adpresso-piloso pallide fusco; lamellis latis adnatis aureis.

On rotten logs in the field. March. Pileus 2 inches across; stem 3 inches high, ⅓ inch thick.

61. A. (FLAMMULA) CHRYSOPELLUS, *B. & C.* (65.) **Pileo umbilicato adpresse tomentoso, quandoque depresso margine subsulcato; stipite elongato graciliore, basi incrassato, fusco; lamellis latis decurrentibus luride aureis.**

On dead wood. Pileus 1½ inch across; stem 3 inches high, 2–3 lines thick. Cespitose.

62. A. (FLAMMULA) CHRYSOTRICHUS, *B. & C.* (54, 26.) **Aureus; pileo obtuso carnoso excentrico, pilis depressis liberis vestito; stipite pallidiore deorsum incrassato pulverulento-fibrilloso; lamellis latis adnexis.**

On rotten logs in fields. February. Pileus 1–1½ inch across; stem 1 inch high, ⅓ inch thick. This and the four preceding species are closely allied, and, like their European relations, probably grow on Conifers.

63. A. (FLAMMULA) HELVOLICEPS, *B. & C.* (90, 93.) **Pileo tenui e convexo depresso glabro helvolo; stipite æquali solido glabro, basi substrigoso, fusco; lamellis adnatis arcuatis ferrugineo-vinosis; sporis majoribus.**

On rotting logs in woods. June and July. Pileus 1 inch across; stem 1–1¼ inch high. Distinguished at once from *A. chrysopellus*, which it somewhat resembles, by the much larger spores. No. 90 differs slightly in the straiter gills and the adpresso-fibrous stem.

64. A. (NAUCORIA) COPRINOCEPS, *B. & C.* (88.) **Pileo e convexo plano, margine demum revoluto, tenui glabro albo; stipite ex albo subrufo æquali leviter fistuloso; lamellis latis adnatis pallide fuscis.**

On logs. May. Pileus ½ inch across; stem ½ inch high. Pileus and stem tawny when dry. This species and the next belong to the same section as *A. hyperellus*.

65. A. (NAUCORIA) EUTHUGRAMMUS, *B. & C.* (27.) **Tenerrimus; pileo convexo striato pallide umbrino; stipite gracili hyalino, basi strigoso; lamellis fuscis adnexis.**

On rotten wood. Pileus ⅓ inch across; stem ½ inch high, filiform. Spores many times as small as in *A. coprinoides*. It has the habit of *A. disseminatus*; but the colour and size of the spores are quite different.

66. A. (NAUCORIA) SIDEROIDES, *Bull.* t. 588; *Fr. Ep.* p. 196. (33.)
On dead wood. *Hab.* Europe.

67. A. (Naucoria) semiorbicularis, *Bull.* t. 422; *Fr. Ep.* p. 197. (101.)

On earth. February. *Hab.* Hindustan, Southern and Northern United States, Europe.

68. A. (Naucoria) oinodes, *B. & C.* (68.) Pileo umbonato striato hemisphærico vinoso glabro; stipite brevi fusco; lamellis adnatis ferrugineo-rubris distantibus.

On rotten wood. Gregarious. Pileus ¼–⅓ inch across; stem ½ inch high. Spores ferruginous.

69. A. (Naucoria) pectinatus, *B. & C.* (81.) Cæspitosus; pileo e convexo plano depressove glabro tenui profunde striato helvolo; stipite glabro brunneo; lamellis angustis pileo concoloribus adnexis.

On logs in bunches. January. Pileus 1 inch across; stem 1 inch high, 2 lines thick. Spores abundant, ferruginous. Evidently allied to *A. furfuraceus*.

70. A. (Galera) Martianus, *B. & C.* (85.) Helvolus; pileo tenui umbonato plano glabro; stipite gracili leviter sursum deorsumque incrassato; lamellis latis ventricosis læte ferrugineis liberis.

On rotten wood. June. Pileus ¼ inch across; stem ¾ inch high, capillary. Spores bright ochraceous.

71. A. (Crepidotus) alveolus, *Lasch. Fr. Ep.* p. 210. (37.)

On dead wood. *Hab.* United States, Europe.

72. A. (Crepidotus) pyrrhus, *B & C.* (38.) Pileo conchiformi sessili glabro rufo; lamellis latis concoloribus; sporis ferrugineis echinulatis.

On dead wood. Pileus ⅓–1 inch across; ⅓–½ inch long.

Var. sporis lævibus (38 A, 59), leiospora.

On logs. August. There appears to be no assignable difference except in the spores, as far as regards the dried specimens.

73. A. (Crepidotus) musæcola, *B. & C.* (86.) Primum hemisphæricus stipite centrali, demum galeæformis, pileo tenui albo, stipite brevissimo excentrico lateralique pulverulento; lamellis latis adnexis pallide fuscis vel purpureo-fuscis.

On dead plantain-leaves near the ground. May. Pileus ½ inch across. Spores purple-brown, obovate.

73*. A. (Crepidotus) cacaophyllus, *B. & C.* (807.) Pileo excentrico subreniformi luteolo squamoso, marginem versus tomentoso; stipite brevi; lamellis adnexis, postice attenuatis fuscis distantibus.

On dead wood. Pileus ½ inch across; stem 2 lines high, 1 line thick. Gills chocolate-brown. Spores ochraceous.

74. A. (Psalliota) bambusigena, *B. & C.* (82, 83, 104.) Pileo um-

bonato e convexo plano fibroso-squamuloso rufulo marginem versus albo; stipite deorsum incrassato fibroso-squamoso albo; annulo superiore amplo; hymenio e pallide rubro brunneo; lamellis postice rotundatis liberis.

On dead roots of Bambusa in thick masses. September. Pileus 2½–3 inches across; stem 3 inches high, ⅓ inch thick in the centre. No. 82 is a variety with a smooth stem; No. 83 is a much smaller variety, looking like a *Lepiota*, but with brown-purple spores $\frac{1}{4500}$ inch long, in which respect it differs from a nearly allied species from St. Domingo, *A. Sallei*, B., in which the spores are from $\frac{1}{3000}$ to $\frac{1}{2250}$ inch long.

75. A (Psilocybe) dichromus, *B. & C.* (96.) **Pileo e conico plano tenui glabro helvolo; stipite fistuloso glabro albo; lamellis tenuibus distantibus adnexis fuscis.**

On rotten wood. December. Pileus ½ inch across; stem 1 inch high, 1½ line thick. Spores purple-brown. Resembling, at first sight, *A. coprinoceps*.

76. A. (Psilocybe) subviridis, *B. & C.* (8.) **Pileo umbonato depresso glabro subviridi, umbone fusco; stipite gracili fistuloso glabro, basi plus minus tomentoso; lamellis confertis angustis adnatis.**

On rotten wood. August. Pileus ½ inch across, yellow-green by transmitted light, margin incurved; stem 1½–2 inches high, ½ line thick. Spores purple-brown.

77. A. (Psilocybe) plutonius, *B. & C.* (103.) **Fuscus; pileo e convexo plano tenui glabro; stipite sursum crassiore leviter fistuloso glabro; lamellis latis adnatis antice rotundatis; sporis subglobosis.**

On dead wood. September. Pileus ½–1 inch across; stem 2 inches high, 1 line thick.

78. A (Psilocybe) palmigena, *B. & C.* (106.) **Gregarius; pileo hemisphærico albo demum plano fusco tenui subviscido glabro; stipite ex albo helvolo fistuloso glabro; basi strigoso; lamellis latis liberis fuscis.**

On stumps of Palms in woods. January. Pileus ⅓ inch across; stem 1 inch high, not ½ a line thick. Spores purple-brown.

79. A. (Psilocybe) scatigena, *B. & C.* (28.) **Pileo convexo jecorino; stipite sursum glabro basi tomentoso; lamellis latis dente adnatis; sporis minutis.**

On dung. Pileus ¼ inch across; stem ¾ inch high, 1 line thick. The minute spores distinguish this from *A. bullaceus*.

80. A. (Psathyra) plumiger, *B. & C.* (97.) **Pileo e convexo plano pubescente striato brunneo squamis albis vestito; umbone obtuso;**

stipite gracili fragili fistuloso subpellucido albo; lamellis latis adnexis fuscis.

On sticks in woods. December. Pileus ½ inch across; stem 1½ inch high, 1 line thick.

81. A (PSATHYRA) GYROFLEXUS, *Fr. Ep.* p. 232. (48.)
On dead wood. *Hab.* Europe.

82. A. (PANÆOLUS) CAMPANULATUS, *L., Fr. Ep.* 236. (49, 80).
On dung in woods. July. *Hab.* Ceylon, United States, Europe.

2. HIATULA, *Fr.*

83. H. PURPURASCENS, *B. & C.* (54.) **Pileo pallide purpureo tenui plano glabro; stipite solido sursum subincrassato glabro; lamellis latiusculis liberis.**

On decayed leaves, the mycelium spreading over them. Pileus 1 inch across; stem 1½ inch high.

84. H. CÆSPITOSA, *B. & C.* (72.) **Candida eximie cæspitosa; pileo tenuissimo subhemisphærico striato; stipite gracili glabro; lamellis liberis remotis.**

On logs in dense bunches. Pileus ½–1 inch across.

3. COPRINUS, *Fr.*

85. C. CUBENSIS, *B. & C.* (79.) **Pileo conico-ovato, squamis superficialibus floccosis vestito albo; stipite deorsum incrassato glabro; lamellis confertis liberis purpureo-fuscis.**

On logs. May. Pileus 1½ inch across; stem 1–1½ inch high, 1½ line thick at the base. Spores not black, but rather of a purple-brown tinge, boat-shaped as in *C. micaceus*.

86. C. SPRAGUEI, *B. & C.* (105.) *Ann. of Nat. Hist.* Oct. 1859.
On earth. December. *Hab.* United States, Europe. The spores in this species are differently shaped from those of *C. plicatilis*, and smaller.

4. LACTARIUS, *Fr.*

87. L., sp. (130.)
This is clearly a species of *Lactarius*, from the large echinulate spores; but without notes I cannot identify it.

5. NYCTALIS, *Fr.*

88. N. ASTEROPHORA, *Fr. Ep.* p. 371. (802.)
On dead Agarics. January. *Hab.* New England, Europe.

6. MARASMIUS, *Fr.*

89. M. FIBROSIPES, *B. & C.* (3.) **Pileo depresso subcoriaceo tenui**

glabro rufo marginem versus inflexum albido; stipite crassiusculo fibroso-squamoso solido albo fusco-tincto; lamellis confertis angustis liberis postice rotundatis remotis.

On dead wood. Pileus 1½ inch across; stem 1 inch high, 2 lines thick. "Spores white."

90. M. RUGULOSUS, *B. & C.* (145.) **Pileo hemisphærico multisulcato glabro subfusco, umbone obscuriore depresso; stipite atrofusco sparse pubescente; lamellis adnatis ventricosis albidis.**

On sticks and leaves. December. A fine species, allied to *M. fœtidus.*

91. M. SUBCORACINUS, *B. & C.* (22.) **Pileo plano rugoso coriaceo helvolo; stipite subvelutino glabrescente fusco; lamellis distantibus adnatis fuscis.**

On sticks in woods. May.

92. M. BADIUS, *B. & C.* (34.) **Pileo convexo striato glabro, margine incurvo; stipite pruinoso glabrescente; lamellis ventricosis distantibus leviter adnatis crassis postice rotundatis, interstitiis lævibus.**

On bark amongst moss. Pileus ½–¾ inch across; stem 1 inch high, 1 line thick, thickened above and below.

93. M. CORACIPES, *B. & C.* (30.) **Pileo convexo tenui lævi pallide fusco; stipite subexcentrico pileo concolore crassiusculo sulcato glabro; lamellis confertis angustis inæqualibus adnexis pallide rufis.**

In woods. Pileus ½ inch across; stem 1½ inch high.

94. M. CORACICOLOR, *B. & C.* (10.) **Pileo tenui lento rugoso-sulcato depresso vel umbilicato rufo; stipite rufescente glabro sulcato; lamellis confertis pileo concoloribus attingentibus.**

On logs in woods. May. Pileus ¾ inch across; stem 1 inch high, cartilaginous. Spores minute, reniform, grey when seen in a mass.

95. M. TENEBRARUM, *B. & C.* (108.) **Pileo convexo umbilicato tenui radiato-striato pallide rufo glabro; stipite glabro solido crassiusculo albido; lamellis confertis angustis adnatis pallide fuscis.**

On sticks in woods. December. Pileus ⅓ inch across; stem ⅓ inch high, cartilaginous. Colour rufous, when dry.

96. M. SERICIPES, *B. & C.* (56.) **Pileo convexo tenui rugoso; stipite crassiusculo sericeo glabrescente; lamellis distantibus angustis adnatis, interstitiis lævibus.**

On dead sticks in woods. Vinoso-rufous when dry. Pileus ¾ inch across; stem 1–1¼ inch high, 1–2 lines thick. Allied to *M. rhyssophyllus.*

97. M. RHYSSOPHYLLUS, *Mont. MS.* (7). **Pileo ex adpresso fibroso**

glabro pallide flavo; stipite concolore glabro basi strigoso; lamellis distantibus, interstitiis trabeculatis flavis.

On dead or decaying sticks in thick woods. August. *Hab.* Guiana. Pileus 1 inch across; stem 1 inch high, 1 line thick. "Whitish or pale yellow."

98. M. PUTREDINIS, *B. & C.* (137.) **Pileo plano tenui glabro helvolo vel griseo; stipite concolore solido æquali glabro; lamellis angustis adnatis albis.**

On rotten wood in forests. June. Pileus ½–1 inch across; stem ¾ inch high, ½ line thick. "Spores white."

99. M. SUBGLOBOSUS, *B. & C.* (20, 92.) **Pileo hemisphærico vel subgloboso flavo; stipite glabro basi dilatato sulcato, lamellisque latis adnatis concoloribus.**

On sticks in woods. May. Pileus ⅛ inch broad; stem ¼ inch high. No. 92 is a variety three times as large.

100. M. ATRO-VIRIDIS, *B. & C.* (39.) **Pileo depresso tenui glabro atro-cæruleo-viridi; stipite sursum dilatato glabro; lamellis confertis adnexis latis concoloribus.**

On rotten wood in thickets. November. Pileus ⅛ inch across; stem ½ inch high.

101. M. ALBO-FUSCUS, *B. & C.* (87.) **Pileo plano umbonato tenui striato reticulato albo, centro fusco; stipite solido glabro sursum leviter incrassato; lamellis paucis distantibus latis adnato-decurrentibus, interstitiis trabeculatis.**

On logs in woods. June. Pileus ½ inch across; stem 1 inch high, slender.

102. M. SEMIUSTUS, *B. & C.* (50.) **Albus, exsiccatus rufus; pileo excentrico e convexo plano rugoso sulcatove glabro; stipite brevi compresso glabro; lamellis distantibus attingentibus, interstitiis hic illic rugosis.**

On rotten wood. May. Pileus ⅓–½ inch across; stem ¼ inch high.

103. M. VIRIDI-FUSCUS, *B. & C.* (41.) **Pileo tenui plano radiato-striato pallide viridi; stipite tenui glabro sursum incrassato deorsum atro-fusco; lamellis latis distantibus decurrentibus viridibus.**

On dead sticks in mountains. November. Pileus ½ inch across; stem ½ inch high.

104. M. CYATHIFORMIS, *B. & C.* (84.) **Cæspitosus; pileo cyathiformi glabro; stipite sursum dilatato; lamellis distantibus decurrentibus.**

On dead wood. Pileus ¾–1 inch across; stem 1 inch high,

½ line thick. The colour of the dry plant, which is very distinct, is brown.

105. M. PURPURASCENS, *B. & C.* (44.) **Pileo tenui infundibuliformi subtiliter tomentoso striatulo pallide purpureo, sicco albido; stipite glabro, lamellisque confertis angustis decurrentibus concoloribus.**

On sticks in shady woods. October. Pileus ¾ inch across; stem 1 inch high. Allied to *M. inoderma* and *M. clavatus*, B.

106. M. CUBENSIS, *B. & C.* (61.) **Albidus; pileo plano umbonato tenui sulcato rugoso; stipite tenui insititio pulverulento; lamellis tenuibus distantibus, interstitiis trabeculatis adnexis.**

On dead wood. Pileus ¾ inch across; stem 1 inch high, slender.

107. M. DEALBATUS, *B. & C.* (4.) **Pileo convexo candido opaco umbonato; stipite cartilagineo pruinoso sursum dilatato insititio; lamellis confertis venosis.**

On fragments of grass, &c. Pileus ¼ inch across, resembling kid leather; stem ½ an inch high, not rigid as in the *rotula* section.

108. M. CANDIDUS, *Fr. Ep.* p. 381. (17, 150, 151.)

On fallen leaves, roots, &c. December. *Hab.* Europe.

109. M. STYLOBATES, *B. & C.* (67.) **Albus, pileo tenui glabro e convexo plano marginem versus inflexum sulcato; stipite e basi orbiculari oriundo glabro cavo; lamellis latis distantibus liberis.**

On rotten wood. December. Pileus about 2 lines across; stem ½ inch high. Sometimes two stems spring together from the same disk. Allied to *M. coilobasis*, B.

110. M. TENERRIMUS, *B. & C.* (139.) **Albidus; pileo e convexo plano subpellucido centro depresso tenerrimo tomentoso; stipite solido pallide fusco pubescente; lamellis latis adnatis pileo concoloribus.**

On rotten sticks in woods. August. Pileus ½ inch across; stem ½ inch high, setiform.

111. M. PETIOLORUM, *B. & C.* (140.) **Gregarius; pileo e convexo subplano subpellucido striato pruinoso; stipite pellucido pruinoso insititio; lamellis paucis adnatis latis candidis.**

On petioles or midribs of dead leaves. August. Pileus ½ line across; stem ¼ inch high.

112. M. PROLETARIUS, *B. & C.* (9, 13.) **Gregarius albus; pileo convexo leviter sulcato, margine primum rotundato inflexo; stipite pallido rigido opaco; lamellis planis vel demum ventricosis latiusculis attingentibus.**

On dead sticks. Pileus 1 line across; stem ½–¾ inch high, setiform. Occasionally repent tomentose threads proceed from the

base of the stem. This pretty species, which forms a little forest of pilei, commences the *rotula* series, and resembles such European forms as *M. epiphyllus*, rather than the highly coloured species which abound in Cuba and some neighbouring countries.

113. M. TENER, *B. & C.* (7, 107.) *Proc. Am. Ac.* vol. 4. p. 121.
On rotten wood. December. *Hab.* Bonin Isles, South Carolina.

114. M. INÆQUALIS, *B. & C.* (8.) Pileo convexo albo plicato; stipite elongato, sursum pellucido albo, deorsum opaco nitido luteo-pallido, basi strigoso, subtiliter furfuraceo; lamellis paucis crassis obtusis albis.
On dead sticks.

115. M. HINNULEUS, *B. & C.* (155.) Helvolus, pileo nitido glabro subconico sulcato; stipite pellucido basi strigosa affixo glabro; lamellis crassis distantibus adnexis.
On dead leaves. October. Pileus $\frac{1}{3}$ inch across; stem 1 inch high, more pellucid than in its immediate allies.

116. M. GUYANENSIS, *Mont. Syll.* p. 139. (159, 163.)
On dead leaves. *Hab.* Guiana.

117. M. EXUSTUS, *B. & C. Proc. Am. Ac.* vol. 4. p. 120. (21.)
On fragments of dead herbaceous plants. *Hab.* Bonin Isles.

118. M. ROTULA, *Fr. Ep.* p. 385. (142) var. FUSCUS. (806.)
On little dead twigs. Pileus brown in the variety. We see no other difference. *Hab.* United States, Europe.

119. M. PERSONATUS, *B. & C.* (10.) Pallide fulvus; pileo depresso striato; stipite glabrescente basi strigosa orbiculari affixo opaco rigido, sicco sulcato; lamellis confertis adnexis.
On dead leaves. Pileus $\frac{1}{4}$ inch across; stem $1\frac{1}{2}$ inch high.

120. M. CHRYSOCHÆTES, *B. & C.* (162.) Pileo albo convexo sulcato umbilicato circa umbonem depresso; stipite gracili elongato insititio glaberrimo fulvo; lamellis paucis candidis latiusculis collariatis.
On dead leaves. Pileus 1 line across; stem 1 inch or more high.

121. M. ACICULÆFORMIS, *B. & C.* (152, 153.) Gregarius, pileo convexo fulvo vix sulcato; stipite setiformi rigido glaberrimo nitido subfulvo; lamellis paucis albidis.
On sticks in woods. November. Pileus 2 lines across; stem $1\frac{1}{2}$ inch high. The forest of stiff shining stems is characteristic of the species.

122. M. FERRUGINEUS, *B. Lond. Journ. Bot.* vol. 2. p. 630. (148.)
On dead leaves, sticks, &c. *Hab.* Brazil, Guiana, River Amazon, Texas.

123. M. ATRO-RUBENS, *B. l. c.* vol. 1. p. 138. (102, 146.)

On dead leaves in woods. December. *Hab.* River Amazon, Guiana, Surinam.

124. M. HÆMATOCEPHALUS, *Mont. Cub.* p. 418. (147, 164.) Var. OBSCURIOR.

On dead leaves, rotten wood in forests, &c. January. *Hab.* Brazil, River Amazon, Surinam, Upper Carolina. Pileus browner than in the more typical form.

125. M. PŒCILUS, *B. in Hook. Kew. Misc.* vol. 8. p. 137. (157.)

On dead leaves. *Hab.* River Amazon.

126. M. HELVOLUS, *B. l. c.* p. 136. (154.)

On sticks. October. "Gills white." *Hab.* River Amazon.

127. M. FLORICEPS, *B. & C.* (31.) **Pileo e conico plano umbonato sulcato glabro læte rubro-fusco; stipite torto cavo deorsum fusco nitido glabro; lamellis paucis latis albis.**

On rotten wood. February. Pileus $\frac{3}{4}$ inch across; stem $1\frac{1}{2}$ inch high, 1 line thick. Allied to *M. atro-rubens* and *M. hæmatocephalus*, but with a much thicker stem.

128. M. TORTIPES, *B. & C.* (156.) **Pileo ex albo plumbeo puberulo campanulato umbilicato sulcato; stipite elongato torto subdiaphano glabro basi membrana e matrice oriunda vestito; lamellis cum pileo concoloribus.**

On rotten wood. May. Pileus $\frac{1}{2}$ inch across; stem 3 inches high, 1 line thick. A fine species remarkable for the abundant mycelium covering the surface of the wood.

129. M. HYPOPHÆUS, *B. & C.* (19.) **Pileo tenui subgloboso demum plicato-sulcato sanguineo-rufo; stipite umbrino rigido opaco striato; lamellis paucis crassis attingentibus phæis, basi orbiculari byssoideo-rugosa.**

On dead wood. Pileus $\frac{1}{2}$ inch across; $\frac{3}{4}$ inch high.

130. M. PHÆUS, *B. & C.* (18.) **Phæus; pileo tenui sphærico; stipite opaco fusco, basi spongiosa affixa, sursum subpellucido atro; lamellis paucis pileo concoloribus.**

On dead bark. Pileus $\frac{1}{8}$ inch; stem $\frac{1}{2}$–$\frac{3}{4}$ inch high.

131. M. TOMENTELLUS, *B. & C.* (21.) **Pileo convexo sulcato fulvo, stipite communi repente nigro albo-pubescente; stipitibus fertilibus brevibus pubescentibus; lamellis paucis pileo concoloribus.**

On dead wood. Pileus 1 line across; fertile stems 2 lines high. Common stem many inches long.

132. M. MULTICEPS, *B. & C.* (475, 160.) **Pileo candido hemisphærico umbilicato sulcato transverse rugoso; stipite communi repente proli-**

fero nigro rigido; stipitibus fertilibus verticalibus; lamellis candidis collariatis paucis ventricosis.

On dead logs in wood. November. Nearly allied to *M. polycladus*, Mont., but differing in colour, and in the attachment of the fertile stems. Pileus ¼ inch across; stem ½–1 inch high. Common stem many inches long.

133. **M. MERULINUS, *B. & C.* (77, 138, 5, 6, 25, 29.)—Agaricus merulius, *Ber.*!, *Mont. in Ann. d. Sci. Nat.* sér. 2. vol. iii. p. 448.**

On sticks in woods. July, December. *Hab.* Juan Fernandez, Alabama. "White."

134. **M. NIDULUS, *B. & C.* (12, 23, 63, 56, 78.) Pileo resupinato primum pezizæformi demum uno latere libero pruinoso-flocoso albo; stipite brevissimo pruinoso vel nullo; lamellis paucis crassis ventricosis, interstitiis lævibus.**

On sticks in woods. Pileus 1–3 lines across.

135. **M. PURPUREUS, *B. & C.* (15.) Pileo e convexo plano tenui sulcato tomentoso purpureo; stipite excentrico brevissimo solido sursum incrassato albido; lamellis latis distantibus adnexis purpureis, interstitiis lævibus.**

On stumps in woods. Pileus ¾ inch across; stem 1–2 lines high.

136. **M. OBLIQUUS, *B. & C.* (40, pro parte.) Pileo flabelliformi glaberrimo polito margine involuto; stipite obliquo brevissimo cylindrico; lamellis distantibus adnato-decurrentibus, siccis fuscis, interstitiis lævibus.**

On dead wood in ravines. November. Pileus ¾ inch across; stem 1 line high.

137. **M. ARACHNOIDEUS, *B. & C.* (53.) Albus, pileo resupinato adnato, stipite brevissimo demum obliterato e mycelio arachnoideo oriundo; lamellis paucis.**

On dead wood. Pileus 1 line across.

138. **M. CONCOLOR, *B. & C.* (74.) Helvolus; pileo galeæformi irregulari lobato pulverulento; stipite nullo; lamellis latis concoloribus.**

On sticks in woods. December. Pileus 1–2 lines across.

139. **M. HÆMATODES, *B. & C.* (30.) Pileo glabro sanguineo-jecorino galeæformi rigido; stipite nullo; lamellis venosis crassis concoloribus.**

On dead sticks. Pileus 1 line broad.

7. PANUS, *Fr.*

140. **P. WRIGHTII, *B. & C.* (42.) Albus, pileo flabelliformi lobato**

subtomentoso lævi vel plus minus sulcato; stipite brevi vel obsoleto, lamellis latis distantibus decurrentibus.

On dead wood. Pileus 2½ inches across; sometimes even.

141. P. CUBENSIS, *B. & C.* (114.) **Pileo convexo lobato excentrico lævi glabro; stipite brevi fibrilloso-striato; lamellis decurrentibus integris.**

On dead wood. Allied to the last, but with an excentric pileus and reniform spores not more than half as long.

142. P. CANTHARELLOIDES, *Mont.*! *Syll.* p. 148. (165.)

On logs in woods. December. "White or yellowish." *Hab.* Guiana.

8. LENTINUS, *Fr.*

143. L. VILLOSUS, *Fr. Ep.* p. 388. (69, 70, 71, 178.)

On dead wood. *Hab.* Mauritius, Brazil, St. Domingo, River Amazon.

144. L. WRIGHTII, *B. & C.* (179.) **Pileo depresso circinato fulvo, pilis adpressis, lineato-virgato; stipite albido undulato fibrilloso farinaceo nec squamuloso; lamellis pallidis integris.**

On dead wood.

145. L. TENER, *Fr. Ep.* p. 389. (180.)

On dead wood. *Hab.* Mauritius, River Amazon, St. Domingo, South Carolina.

146. L. SCHOMBURGKII, *B. Linn. Tr.* vol. xx. (68, 181.)

On dead wood. *Hab.* British Guiana.

147. L. LECOMTII, *Fr. Ep.* p. 388. (78.) *Mont.*! *Cub.* p. 417.

On dead wood. *Hab.* Ceylon, Hindustan, Southern United States, Hungary.

148. L. STUPPEUS, *Fr. Ep.* p. 388. (174.)

On dead wood. *Hab.* Mauritius.

149. L. SUBCERVINUS, *B. & C.* (177.) **Pileo profunde umbilicato pallide cervino circinato stuppeo; stipite furfuraceo squamuloso; lamellis pallidis dentatis distantibus glandulosis.**

On dead wood. Hard and contracted when dry. Allied to *L. prærigidus*, B. Gills like those of *L. villosus*. Pileus about 2 inches across.

150. L. RIGIDULUS, *B. & C.* (175.) **Pileo profunde umbilicato (sicco rigido) centro piloso-squamuloso adpresso lineat omargine, circinato piloso; stipite brevi furfuraceo squamuloso albido; lamellis distantibus dentatis pallidis eglandulosis.**

On logs in open fields. "Spores white." Pileus 1½ inch

across; stem ½ inch high, thickened above. Allied, like the last, to *L. prærigidus.*

151. L. SPARSIBARBIS, *B. & C.* (76.) Pileo depresso pilis fasciculatis fulvis ornato; stipite cylindrico velutino; lamellis tenuibus flaccidis integris.

On dead wood. Pileus 1¼ inch across. Towards the centre the fascicles of hairs become scattered and depressed.

152. L. SIPARIUS, *B. & C.* (182, 171.) Aurantiacus, pileo profunde umbilicato lanato pilis fasciculatis erectis rigidis intermixtis; stipite cylindrico velutino; lamellis integris.

On dead wood. February. Pileus 1 inch across, pallid, contracted when dry; stem 1 inch high, rather thickened at the base, tawny. Pileus not grooved.

153. L. STRIGOSUS, *Fr. Ep.* p. 388. (77.)

On dead wood. *Hab.* Ceylon, Guiana.

154. L. VELUTINUS, *Fr. Linn.* 1830, p. 510; *Mont.*! *Cub.* p. 416. (66, 67, 73, 74.)

On dead wood. *Hab.* Brazil, Guiana.

155. L. BLEPHARODES, *B. & C.* (72, 75, 170.) Pileo umbilicato depresso hispido margine ciliato, pilis evanescentibus radiato-striato; stipite velutino; lamellis distantibus integris subcarneis, interstitiis venosis vel lævibus.

On rotting logs in fields. December. Pileus 2 inches across, brown; stem 2–4 inches high.

156. L. LEPRIEURII, *Mont.*! *Syll.* p. 145. (183.)

On dead wood. *Hab.* Guiana.

157. L. NEPALENSIS, *B. Hook. Journ.* 1854, p. 131. (169.)

On logs. December. *Hab.* East Nepal. Stem piloso-hispid, not merely velvety; gills entire.

158. L. CHRYSOPEPLUS, *B. & C.* (172.) Pileo convexo dense furfuraceo-velutino marginem versus subsquamuloso luteo; stipite concolore furfuraceo-squamuloso; lamellis albis integris.

On logs in a creek. January. Pileus densely velvety, with fasciculate hairs towards the margin, ¾ inch across; stem 1 inch high, 2 lines thick, furfuraceous above, not velvety, furfuraceo-squamulose below; gills distant, slightly decurrent. "Spores white."

159. L. VELLEREUS, *B. & C.* (167.) Albus, siccus fulvus; pileo in-

fundibuliformi velutino, margine involuto; stipite brevi cylindrico fibrilloso solido; lamellis distantibus latis integris decurrentibus.

On logs. April. Pileus 6 inches across, sometimes excentric; stem 1 inch high, ½ inch thick. "Spores white."

160. L. STRIGELLUS, *B.* (79.) **Pileo infundibuliformi squamis minutis obsito, margine ciliato; stipite brevi hispidulo.**

On dead wood. *Hab.* Peru. Pileus 2–3 inches across; stem ½–1 inch high, ⅓ inch thick.

161. L. CUBENSIS, *B. & C.* (80, 115, 121, 122.) **Pileo convexo carnoso glabro marginem versus sæpe guttato; stipite curvo cylindrico furfuraceo-fibrilloso vel subsquamuloso, excentrico; lamellis flaccidis adnatis dentatis, siccitate e stipite secedentibus.**

On logs in woods. May. Pileus 1–1½ inch across; stem ¾–1 inch high, 2 lines thick, striate, sometimes with a few erect or reflexed scale-like shreds. Becomes dark when old and exposed to weather.

162. L. PROXIMUS, *B. & C.* (27, 117.) **Pileo e convexo plano glabro excentrico; stipite curvo furfuraceo; lamellis adnatis dentatis vel adnato-decurrentibus, siccitate vix secedentibus.**

On dead wood. Very nearly allied to the last; but the gills do not secede so far as to leave a large circular depression round the top of the stem.

163. L. FULIGINEUS, *B. & C.* (25.) **Pileo infundibuliformi fuligineo glabro; stipite basi incrassato striato glabro; lamellis angustis integris rigidis; mycelio membranaceo expanso.**

On logs in woods. January. Pileus 2 inches across; stem 1 inch high, 2–3 lines thick. Mycelium externally membranaceous, within the wood fibrous. Allied to *L. exilis.*

164. L. EXILIS, *Kl. Ann. of Nat. Hist.* vol. 3. p. 379. (33, 173.)
On dead wood. *Hab.* Ceylon, Mauritius.

165. L. FRIABILIS, *Mont. Cub.* p. 415; *Fr. Ep.* p. 394.
On dead bark.

166. L. GLABRATUS, *Mont.* ! *Cub.* p. 424. (62.)
On dead wood.

167. L. EUGRAMMUS, *Mont.* ! *Cub.* p. 414. (4, 35, 42, 14, 119, 123.)
On dead wood. January, May, December. *Hab.* St. Domingo, Mexico.

168. L. CASTOREUS, *Fr. Ep.* p. 395. (36, 168.) Var. HIRNEOLOIDES. **Pallide fuscus, lamellis pallidioribus; pileo tenui.**

On rotten logs in woods. February. *Hab.* Pennsylvania, Europe.

Var. PUSILLUS. (35.) Pileo tenuiore, glabrescente.

169. L. VERÆ-CRUCIS, *B. MS.* (40, pro parte.) Pileo tenui flabelliformi farinaceo-tomentoso albo; stipite brevi cylindrico; lamellis distantibus integris latiusculis.

On stumps in woods. November. Pileus 1–1½ inch across; stems 2 lines high, farinaceous. *Hab.* Vera Cruz, August 1854.

9. XEROTUS, *Fr.*

170. X. NIGRITA, *Lev. Ann. Sc. Nat.* 1846, vol. 5. p. 120. (99.)

On dead bark. June. *Hab.* Southern United States.

171. X. LATERITIUS, *B. & C.* (149.) Pileo suborbiculari vertice affixo sulcato lateritio; lamellis distantibus latiusculis integris nigris.

On dead dark. *Hab.* Chili, South Carolina.

10. SCHIZOPHYLLUM, *Fr.*

172. S. COMMUNE, *Fr. Ep.* p. 403. (65, 166.) *Mont.*! *Cub.* p. 413.

On dead wood. *Hab.* Cosmopolitan.

173. S. UMBRINUM, *B. Hook. Journ.* 1851, p. 15. (64.)

On dead wood. *Hab.* Surinam, Peru.

11. LENZITES, *Fr.*

174. L. DEPLANATA, *Fr. Ep.* p. 404. (210.)

On dead wood. *Hab.* West Africa, River Amazon, Nepal, Brazil.

175. L. REPANDA, *Fr. Ep.* p. 404. (207, 208.)—Dædalea repanda, *Mont.*! *Cub.* p. 382.

On dead wood. *Hab.* Rawak, Ceylon, Sikkim, Borneo, New Zealand, Alabama, St. Domingo.

176. L. CUBENSIS, *B. & C.* (81, 83, 185.) Pileo duro ligneo dimidiato subvelutino cervino zonato rugoso; stipite nullo vel brevissimo; lamellis repetite furcatis crenatis vel crispis concoloribus latioribus.

On dead wood. Pileus 2½ inches broad, 1½ long.

177. L. STRIATA, *Fr. Ep.* 406. (82, 184.)

On dead wood. *Hab.* Borneo, River Amazon, St. Domingo, Jamaica, British Guiana, Cayenne, Southern United States.

12. BOLETUS, *L.*

178. B. LIGNATILIS, *B. & C.* (6.) Pileo glabro rubro; stipite elongato furfuraceo; hymenio viridi-flavo.

On rotten wood in thick woods. Pileus 1–1½ inch across; stem 2–1¼ inch high, 2–3 lines thick.

179. B. CUBENSIS, *B. & C.* (344.) **Pileo squamuloso vaccino; stipite deorsum incrassato albo sursum vaccino transversim squamoso; poris flavo-viridibus amplis adnatis.**

On the ground. October. Pileus 1¼ inch across, scales minute; stem 2¼ inch high, ½ inch thick, clavate at the base. No. 343 is another species of *Boletus*, attacked by *Sepedonium*, and indeterminable.

13. POLYPORUS, *Fries*.

180. POLYPORUS (MESOPUS) ARCULARIUS, *Fr. Ep.* p. 430. (92.)

On decayed wood. *Hab.* Neelgherries, Ceylon, New Zealand, Texas, Pyrenees.

181. P. (MESOPUS) ÆMULANS, *B. & C.* (91.) **Pileo umbilicato radiato-striato glabrescente ochraceo, margine subtiliter hispidulo subcinereo; stipite æquali brunneo pulverulento; poris alveolaribus.**

On decayed wood. Pores $\frac{1}{30}$ inch across; dissepiments rigid. Pileus 1½ inch across; stem ¾ inch high, ⅛ inch thick. Stem different from that of *P. arcularius*.

182. P. (MESOPUS) TRICHOLOMA, *Mont. Cub.* p. 411; *Fr. Ep.* 431. (85, 87, 88, 89.)

Var. Poris majoribus. (381, 383, 84.)

On rotten sticks. February. *Hab.* Guiana, Mexico.

183. P. (MESOPUS) STIPITARIUS, *B. & C.* (90.) **Albus; pileo orbiculari profunde umbilicato tenui glabro, margine epiloso; stipite gracili glabriusculo; poris minimis angulatis acie subintegris.**

Var. Poris majoribus. (384.)

On logs. July. Pileus ¾–1 inch across; stem ¾ inch high, not a line thick. Pores $\frac{1}{200}$. Spores white. The variety is apparently more cæspitose, and on a rather larger scale, the pores $\frac{1}{150}$.

184. P. (MESOPUS) ACICULA, *B. & C.* (95.) **Pileo orbiculari convexo glabro umbilicato, margine involuto; stipite filiformi glabro; poris parvis alveolaribus.**

On rotten wood. Pileus not a line across; stem ⅓ inch high, quite smooth, with a little down at the base. A very elegant little species.

185. P. (MESOPUS) SIMILIS, *B. Hook. Lond. Journ.* p. 635. (86.)

On dead wood. *Hab.* Brazil.

186. P. (MESOPUS) VIRGATUS, *B. & C.* (93, 94, 375.) **Pileo orbiculari depresso demum e cuticula rupta virgato carnoso tomentoso glabrescente; stipite sursum incrassato; poris mediis angulatis, dissepimentis tenuibus dentatis, decurrentibus.**

On dead wood. Pileus 3 inches across, rufous when dry; stem

1 inch high, $\frac{1}{4}$–$\frac{1}{2}$ inch thick, at first fibrillose, at length dark; pores $\frac{1}{50}$.

187. P. (Mesopus) discoideus, *B. & C.* (379.) Carnosus; pileo orbiculari lævi glabro, margine tenui; stipite crasso hispidulo; poris mediis subangulatis demum sinuosis, dissepimentis tenuibus elongatis dentatis; contextu albo.

On dead wood. Pileus 5 inches across, very slightly, if at all, depressed; stem 2 inches high, $\frac{3}{4}$ inch thick; spores white, very abundant. The whole plant, when dry, has an umber tint.

188. P. (Mesopus) craterellus, *B. & C.* (377, 378.) Carnosus, subpellucidus; pileo tenui umbilicato glabro rufo; stipite sursum incrassato pulverulento; poris parvis angulatis acie subintegris decurrentibus, dissepimentis demum elongatis; hymenio albo luteove.

On rotten wood. July. Pileus 2–3 inches across; stem 1–1$\frac{1}{2}$ inch long, $\frac{1}{8}$–$\frac{1}{4}$ inch thick; pores $\frac{1}{100}$. Allied to *P. confluens*, but distinctly mesopod.

189. P. (Mesopus) tuba, *B. & C.* (385.) Pileo cupulæformi glabro; stipite gracili sursum incrassato striato; poris parvis, dissepimentis tenuibus demum elongatis.

On sticks in open grounds. January. White. Pileus $\frac{1}{2}$ inch across, sometimes radiato-rugose, sometimes even; stem 1$\frac{1}{2}$ inch high, 1–2 lines thick, dilated into the pileus; pores $\frac{1}{100}$. The form is exactly that of *Peziza*.

190. P. (Mesopus) scabriceps, *B. & C.* (380.) Pileo carnoso irregulari scabroso umbrino, margine involuto; stipite brevi scabro; poris parvis irregularibus pallidis.

On decayed wood. Pileus 2 inches across, the pubescence so disposed as to present the appearance of minute spurious pores on the pileus; stem $\frac{1}{2}$ inch high, $\frac{1}{4}$ thick; pores $\frac{1}{100}$; dissepiments thin, toothed.

191. P. (Mesopus) hydniceps, *B. & C.* (354, 356.) Carnosus, versus marginem processibus brevibus cylindraceis vel subpyramidatis hydneideis exasperato; poris brevibus.

On dead wood. Pileus 1$\frac{1}{2}$ inch across, sometimes cupshaped with a central stem, sometimes broken up into flabelliform lobes; stem 1 inch long.

192. P. (Mesopus) focicola, *B. & C.* (386, 387.)—P. connatus, *Schwein.*

On burnt soil and in holes out of which pines have been burnt. June, September. Differs from *P. perennis* in its large pores $\frac{1}{24}$ inch or more across. *Hab.* United States, as far north as Ohio.

193. P. (MESOPUS) SCHWEINITZII, *Fr. Ep.* p. 433. (433.)

On a Pine-stump. May. *Hab.* Himalayas, South Carolina, Europe.

194. P. (PLEUROPUS) PACHYPUS, *Mont. Cub.* p. 421.

On dead wood.

195. P. (PLEUROPUS) TEREBRANS, *B. & C.* (410.) **Pileo subcarnoso crasso convexo flabelliformi luteo pubescenti-scabro; stipite crasso lateraliter compresso, matrici pro magna parte, immerso, pubescente, pileo concolore; hymenio convexo albido; poris parvis acie obtusis.**

On dead trees. Pileus $1\frac{1}{2}$ inch long, $1\frac{3}{4}$ wide; stem $\frac{3}{4}$ inch long and thick; pores $\frac{1}{84}$ inch across, probably much contracted.

196. P. (PLEUROPUS) HYDROPHILUS, *B. & C.* (350, 353.) **Pileo carnoso flabelliformi tomentoso luteo marginem versus zonato, in stipitem brevem crassum angustato; hymenio concolore; poris minimis angulatis dentatis.**

On logs. May. When fresh, heavy and saturated with water. Pileus 2 inches or more across, evidently much contracted; pores $\frac{1}{150}$ inch in diameter; spores white. No. 350 is a small, thinner variety.

197. P. (PLEUROPUS) RHIPIDIUM, *B. Hook. Lond. Journ.* 1847, p. 319. (100, 101, 102, 382 pro parte.)

On sticks, dead wood, &c. *Hab.* Ceylon, Brazil, Guiana, United States as far as Ohio.

198. P. (PLEUROPUS) SUBPULVERULENTUS, *B. & C.* (382 pro parte.) **Pileo reniformi lævi margine involuto stipiteque brevi cylindrico laterali subtiliter pulverulento-tomentosis; poris subhexagonis parvis acie obtusis, brunneolis.**

On dead sticks. Pileus 5–7 lines broad, yellowish; stem $1\frac{1}{2}$ line long; pores $\frac{1}{80}$ inch in diameter. Allied to *P. rhipidium*, but with larger pores.

199. P. (PLEUROPUS) PICIPES, *Fr. Ep.* p. 440. (370, 98.)

On rotten logs in dense woods. February. *Hab.* Ceylon, Brazil, Ohio, Europe.

199*. P. (PLEUROPUS) NEPHRIDIUS, *B. Hook. Journ.* 1856, p. 195. (368.)

On logs in woods. September. *Hab.* River Amazon.

200. P. (PLEUROPUS) ELEGANS, *Fr. Ep.* p. 440. (96, 99, 114.)

On dead wood. *Hab.* Tasmania, United States, Europe.

201. P. (PLEUROPUS) GRAMMOCEPHALUS, *B. Hook. Lond. Journ.* 1842, p. 148. (369, 376.)

On logs in dense woods. January, July. *Hab.* Hindustan,

Ceylon, Philippines, Brazil, Guiana, New Ireland. Pileus yellowish brown; hymenium white.

202. P. (PLEUROPUS) SAGRÆANUS, *Mont. Cub.* p. 409, tab. 16. f. 4.
On trunks of trees.

203. P. (PLEUROPUS) SANGUINEUS, *Fr. Ep.* p. 444. (141, 142, 411.) *Mont. Cub.* p. 410.
On dead wood. *Hab.* Hindustan, Ceylon, Pacific, Mauritius, Surinam, Java, Sierra Leone, New Zealand, Tasmania, Brazil, Southern United States.

204. P. (PLEUROPUS) LUCIDUS, *Fr. Ep.* p. 442; *Mont. Cub.* p. 411.
At the base of trees. *Hab.* Cosmopolitan.

205. P. (PLEUROPUS) LUTEUS, *Nees, Fr. Ep.* p. 445. (373.)
On dead wood. *Hab.* Australia, Nikobar, Brazil.

206. P. (PLEUROPUS) MUTABILIS, *B. & C. Ann. Nat. Hist.* 1853, vol. xii. p. 433. (374.)—P. fibroso-radians, *Mont., Leprieur*, No. 940.
On logs in dense woods. White. July. *Hab.* Guiana, Brazil, South Carolina.

207. P. (PLEUROPUS) PORPHYRITIS, *B. Hook. Journ.* 1856, p. 196. (371.)
On rotten logs. January. "Pileus light brown, whitish on edge; hymenium white." *Hab.* River Amazon.

208. P. (PLEUROPUS) OCHROTINCTUS, *B. & C. Am. Ac.* vol. iv. p. 122. (134, 135, 355.)
On dead wood. *Hab.* Bonin Islands, Japan. Sometimes mesopod. Pores $\frac{1}{180}$ inch in diameter.

209. P. (PLEUROPUS) FLABELLIFORMIS, *Kl. Fr. Ep.* p. 444. (97.)
On dead wood. *Hab.* Sikkim, Ceylon, Mauritius, Borneo.

210. P. (PLEUROPUS) PETALIFORMIS, *B. & C.* (372.) Pileo flabelliformi tenui zonato papyraceo striatulo rufo, postice subtiliter hirto in stipitem subdisciformem super matricem effusum angustato, margine tenuissimo lobato subfimbriato; poris parvis brevibus angulatis acie subobtusis.
On rotten logs. March. Hymenium white; pileus 2½ inches long and broad; pores $\frac{1}{90}$ inch in diameter.

211. P. (PLEUROPUS) POLYGRAMMUS, *B. & C.* (349.) Pileo flabelliformi, hic illic lobato-fisso, coriaceo, lineato, fulvo-umbrino, subtiliter scabroso-hirto, subzonato, opaco, postice in stipitem obsoletum angustato; hymenio ochraceo; poris minimis angulatis; dissepimentis tenuibus dentatis.
On dead wood. Pileus 2 inches long and broad; stem scarcely

more than a disk, but separate from the hymenium beneath; pores $\frac{1}{180}$ inch in diameter.

212. P. (PLEUROPUS) STEREINUS, *B. & C.* (189, 351, 345, 446, 447.) Flabelliformis (siccus rigidus inflexus), pileo tenui plurizonato castaneo-rufo glabro; stipite disciformi; hymenio albo, poris minimis subrotundis acie pruinosis.

On dead trunks and logs. January, February. Pileus ¾–1 inch long and broad; pores $\frac{1}{180}$ inch in diameter. There are two varieties, one with a paler less-rufous shining pileus, the other more rigid, less regular, and not so much zoned.

213. P. (MERISMA) SULFUREUS, *Fr. Ep.* p. 450. (425, 426.)

On dead trunks. *Hab.* Sikkim, New England, Tasmania, Ohio, Europe. Varying from pale yellow to orange, as in English specimens.

214. P. (ANODERMEI) LEUCOMALLUS, *B. & C.* (104.) Carnosus albus; pileo convexo dimidiato fibris adpressis notato, margine inflexo; poris minutis, dissepimentis laceratis elongatis hyalinis.

On dead wood. Pileus ½ inch long, ¾ broad; pores $\frac{1}{120}$ inch in diameter. Allied to *P. lacteus.*

215. P. (ANODERMEI) VERSICUTIS, *B. & C.* (137, 208, 361.) Carnosus (siccus rigidus), imbricatus; pileo rugoso vel tuberculato postice decurrente e tomentoso resinoso-guttato margine obtuso sterili; hymenio umbrino; poris minutis angulatis, dissepimentis tenuibus; contextu pallido.

On rotten logs. October. Pileus 1¼ inch broad, ½ inch long; pores $\frac{1}{140}$ inch in diameter. A smaller form occurs, in which the margin is not so obtuse. The colour of the dry plant is ochraceous. Allied to *P. fragilis*, or, amongst exotic species, to *P. vivax*, B., and *P. nitidulus*, B. & C. Am. Ac. *l. c.*

216. P. (ANODERMEI) ALBOGILVUS, *B. & C.* (415.) Carnosus (siccus rigidus), pileo subflabelliformi e tomentoso resinoso-glabro; hymenio recenti gilvo; poris minutis, dissepimentis tenuibus elongatis; contextu sicco albo.

On dead trees in woods. February. "Hymenium dull reddish;" pileus 1¼ inch broad, ¾ inch long; pores $\frac{1}{140}$ inch in diameter, often broken up towards the margin so as to be almost lamellar. Allied to the last species.

217. P. (ANODERMEI) EVOLUTUS, *B. & C.* (459.) Carnosus (siccus rigidus), centro affixus, evolvens, pileo concentrico zonato e tomentoso resinoso-glabro radiato-rugoso rufo; hymenio pallido; poris minimis hyalinis.

On dead trees. September. Pileus orbicular, 1 inch across;

pores $\frac{1}{180}$ inch in diameter. Allied to the two last, and especially to *P. nitidulus*, B. & C.

218. P. (ANODERMEI) MICROSTOMUS, *B. & C.* (128.) Lentus, pileo breviter reflexo e subtiliter pubescente glaberrimo zonato rufo; poris minimis punctiformibus acie obtusis pruinosis ochraceis.

On dead wood. Laterally connate, $\frac{1}{4}$–$\frac{1}{2}$ inch long; pores $\frac{1}{180}$ inch in diameter. Margin somewhat lobed. Allied to the last, but of a tougher substance.

219. P. (ANODERMEI) NIVOSUS, *B. Hook. Journ.* 1856, p. 196. (103, 414 pro parte.)

On dead wood. *Hab.* River Amazon.

220. P. (ANODERMEI) VERECUNDUS, *B. & C.* (105, 414 pro parte.) Pileo molli convexo ex albo cinerascente tomentoso, margine acuto; hymenio pallido, poris minimis subrotundis acie obtusis intus albis elongatis.

On dead wood. Pileus 2–3 inches broad, 1$\frac{1}{2}$–2 inches long; pores $\frac{1}{180}$ inch in diameter. In colour resembling *P. tephroleucus*, Fr.

221. P. (ANODERMEI) FUMOSUS, *Fr. Ep.* p. 456; *Mont. Cub.* p. 408.

On trunks of trees. *Hab.* Valenzuela, North Carolina, Europe.

222. P. (ANODERMEI) ADUSTUS, *Fr. Ep.* p. 456; *Mont. Cub.* p. 407. (203.)

On dead trees, and on hymenium of *Polypori*. *Hab.* Sikkim, New Zealand, United States, British N. America, up to lat. 54°, Europe.

223. P. (ANODERMEI) ALBOSTYGIUS, *B. & C.* (583.) Pileo e resupinato breviter reflexo tomentoso pallido, margine pulvinato; hymenio nigro; poris minimis punctiformibus intus contextuque albis.

On dead wood. Pileus with pores 2 lines thick; pores $\frac{1}{180}$ inch in diameter, angular under a high magnifier. A very curious species. *P. labyrinthicus*, Fr., is a very different plant from *Irpex maximus*, Mont., and does not appear to have been found in Cuba. I have an authentic fragment of the plant of Schweinitz.

224. P. (ANODERMEI) TRICHOMALLUS, *Mont. & Berk. Syll.* p. 165. (206, 412.)

On dead wood. *Hab.* Guiana, Brazil. Sometimes 9 inches across; clothed with an intricate mass of brown tawny fibres.

225. P. (ANODERMEI) CLADOTRICHUS, *B. & C.* (205.) Pileo dimidiato vel e decurrente reflexo strigoso brunneo; poris mediis angulatis, dissepimentis rigidis demum laceratis dentatis.

On dead wood. Pileus 2–3 inches broad, 1–2 inches long;

pores $\frac{1}{36}$ inch in diameter, 2 lines deep. The pileus has a spongy strigose coating, but not consisting of decumbent fibres as in the last. *P. endothrix*, B., from the River Amazon has much smaller pores.

226. P. (Anodermei) fruticum, *B. & C.* (160, 161, 442.) Pileo tenui molli dimidiato vel vertice affixo fibroso-spongioso azono rhabarbarino; contextu concolore fibroso-radiato; hymenio ferrugineo, poris parvis angulatis, dissepimentis tenuibus dentatis.

On living shrubs, often clasping the twigs. November. Pileus 1½ inch wide, 1 inch long; pores $\frac{1}{70}$ inch in diameter. Hymenium much like that of *P. perennis*: various in size, in colour resembling *P. scruposus*, Fr.

227. P. (Placodermei) cubensis, *Mont. Cub.* p. 404. (424, 496.) On trunks of trees.

228. P. (Placodermei) havannensis, *B. & C.* (133.) Pileo dimidiato convexo zonato fulvo-ochraceo e pubescente glabro radiato-rugosulo, margine leviter pulvinato sterili pubescente; hymenio pallido, poris parvis subrotundis acie obtusis.

On dead wood. Pileus 2 inches wide, 1 inch long; pores $\frac{1}{100}$ inch in diameter. Allied to *P. anebus*, B., but with larger pores.

229. P. (Placodermei) rufo-flavus, *B. & C.* (191.) Pileo dimidiato e subtiliter pubescente glaberrimo polito sublaccato zonato subundulato rufo, margine tenui; hymenio citrino, poris minimis subrotundis acie obtusis.

On dead wood. *Hab.* Venezuela. Pileus ¾ inch wide, ½ inch long; pores $\frac{1}{180}$ inch in diameter. The bright-red pileus, and lemon-coloured hymenium make this, which, like the last, approaches the *Anodermei*, a charming little species.

230. P. (Placodermei) zonalis, *B. Ann. Nat. Hist.* vol. x. p. 375. (140, 346, 360.)—P. micromegas, *Mont. Cub.* p. 423.

On rotting palms &c. January. *Hab.* Sikkim, Borneo, Ceylon, Brazil, Mexico, Lower Carolina. "Hymenium yellow." Much contracted when dry. First gathered by König in Ceylon.

231. P. (Placodermei) australis, *Fr. Ep.* p. 464. (171, 172, 405, 411, 819.) *Mont. Cub.* p. 404.

On trunks of trees. *Hab.* Borneo, Figi Isles, Guiana, Brazil, Khasia, Tasmania, New Zealand, Venezuela, &c.

232. P. (Placodermei) nigricans, *Fr. Ep.* p. 466; *Mont. Cub.* p. 403.

On trunks of trees. *Hab.* Europe.

233. P. (PLACODERMEI) SENEX, *Nees & Mont. Mont. Cub.* p. 403.—P. rhabarbarinus, *Berk.* (174, 814, 818.)

On trunks of trees. *Hab.* Sikkim, Juan Fernandez, Guiana, Brazil, Valenzuela.

234. P. (PLACODERMEI) LICNOIDES, *Mont. Cub.* p. 401. (166, 181, 177, 178.)

On dead branches. *Hab.* Sikkim, Brazil, Guiana.

235. P. (PLACODERMEI) SCLERODES, *B.* (176, 187, 188, 189.) Lignosus, durus, tenuis, dimidiatus, zonatus, pileo e tomentoso glabro rugoso hymenioque subrufis, poris minimis subangulatis acie obtusis; contextu fulvo nec rhabarbarino.

On dead wood. Pileus $1\frac{3}{4}$ inch wide, or by confluence 4 inches, 1–$1\frac{1}{2}$ inch long; pores $\frac{1}{170}$ inch in diameter. The first three numbers are more or less resupinate forms. The species is allied to *P. rubiginosus*, B., which, however, is not zoned, and has the pores $\frac{1}{100}$ inch in diameter. It is moreover a far coarser species. The colour of the hymenium varies according to age, and is sometimes like that of *P. igniarius*.

236. P. (PLACODERMEI) OMALOPILUS, *Mont. Cub.* p. 423.—P. carneofulvus, *B.*

On dead trunks of trees.

237. P. (PLACODERMEI) SCRUPOSUS, *Fr. Ep.* p. 473.—P. gilvus, *Mont. Cub.* p. 409. (175, 179, 180, 182, 183, 402, 403, 434.)

On dead wood. November. *Hab.* East Nepal, Soane River, Tasmania, New Zealand, Mexico, Pennsylvania, Ohio. No. 175 is a coffee-coloured variety, and 179 is nearly even; the species varies greatly in sculpture and thickness; 403 is ungulate.

238. P. (PLACODERMEI) MELANOPORUS, *Mont.*! *Cub.* p. 422.

On bark.

239. P. (PLACODERMEI) CROCITINCTUS, *B. & C.* (198.) Durus, rigidus, reviviscens; pileo zonato-sulcato rugoso brunneo sublaccato glabro, margine lobato, juniore crocato tomentoso; hymenio crocato, poris minutis, dissepimentis tenuibus.

On dead wood. Pileus $1\frac{1}{4}$ inch long and broad, elongato-dimidiate; pores $\frac{1}{130}$ inch in diameter.

240. P. (PLACODERMEI) SUBFLEXIBILIS, *B. & C.* (165.) Pileo subungulato duro sed non omnino inflexibili paucisulcato, umbrino-brunneo subtiliter tomentoso; hymenio concolori, poris minutis, contextu pallido-umbrino.

On dead wood. Pileus $2\frac{1}{2}$ inches broad, or more by confluence, $1\frac{1}{2}$ inch long; pores $\frac{1}{180}$ inch in diameter. Allied to *P. igniarius.*

241. P. (PLACODERMEI) VINOSUS, *B. Ann. Nat. Hist.* 1852. (161, 190, 347.)

On dead erect trees. June. "Dark purplish." *Hab.* St. Domingo.

242. P. (PLACODERMEI) CUPREO-ROSEUS, *B.* (199.) *Hook. Journ.* 1856, p. 233.

On dead wood. *Hab.* River Amazon. Sometimes 9 inches broad, and 4½ inches long. A noble species.

243. P. (PLACODERMEI) PINICOLA, *Fr. Ep.* p. 468. (812.)

On pine-trunks. *Hab.* Europe.

244. P. (PLACODERMEI) AUBERIANUS, *Mont. Cub.* p. 399. (132, 200, 422.)

On trunks of trees. *Hab.* Brazil, Guiana, Mexico.

245. P. (PLACODERMEI) HEMILEUCUS, *B. & C.* (167, 407, 417, 419, 423, 428.) **Pileo suberoso crassiusculo rigido dimidiato subtiliter tomentoso albo, postice leviter laccato rufo; hymenio albo, poris minutis rotundis acie obtusis.**

On logs in woods. January. Pileus 3 inches broad, 1½ inch long; pores $\frac{1}{130}$ inch in diameter. Allied to *P. vulneratus*, Lev., which, is, however, a very different species, with still smaller pores. In 407 the hinder part of the pileus is not yet laccate. *P. Persoonii*, Mont., is also allied, but has very much larger pores.

246. P. (PLACODERMEI) ANNOSUS, *Fr. Ep.* p. 471. (477, 817.)

On logs in Pine-woods. *Hab.* United States, Europe.

247. P. (PLACODERMEI) CARNEUS, *Nees, Fr. Ep.* p. 471. (409, 815.)

On dead wood. *Hab.* Brazil, South Carolina, New York, Java.

248. P. (PLACODERMEI) FERREUS, *B. Hook. Lond. Journ.* 1847, p. 502. (813.)

On dead trees. *Hab.* Ceylon, Brazil.

249. P. (PLACODERMEI) SCLEROMYCES, *B. & C.* (168.) **Durus, ligneus; pileo convexo subtenui concentrice sulcato tuberculato, subtiliter tomentoso umbrino, contextu porisque longis parvis angulatis concoloribus.**

On dead wood. Pileus 2 inches long, 3 broad; pores $\frac{1}{90}$ inch in diameter; reviviscent.

250. P. (INODERMEI) PRUINATUS, *Klotz. in Linn.* viii. p. 486; *Mont. Cub.* p. 397.

On dead bark. *Hab.* Mauritius.

251. P. (INODERMEI) VALENZUELIANUS, *Mont. Cub.* p. 398. (186.)

On dead trees.

252. P. (INODERMEI) PLEBEIUS, *B. Fl. of New Zeal.* p. 179. (398, 399, 400, 401, 408.)

Var. CUBENSIS. Pileo dimidiato luride purpureo (sicco umbrino) pruinato; hymenio concolore, poris minutis.

On trunks and logs. October, January, March. *Hab.* Himalaya, New Zealand, Brazil.

The Cuba plant, when fresh, is described as "dark purplish." "Hymenium purple." It seems identical with that from the Himalayas and Brazil, of the colour of which, however, there is no record.

253. P. (INODERMEI) SUBOLIVACEUS, *B. & C.* (163, 164.) Pileo rigido crassiusculo tomentoso extus ezonato rugoso subolivaceo, margine obtuso; contextu fibroso zonato concolori; poris minutis brunneis acie subtomentosis.

On dead wood. Pileus 2 inches broad, 1 inch long; pores $\frac{1}{100}$ inch in diameter: in *P. valenzuelianus* they are much smaller, not exceeding $\frac{1}{150}$.

254. P. (INODERMEI) FULVITINCTUS, *B. & C.* (136.) Pileo antice reflexo postice decurrente tomentoso alutaceo-fulvo; contextu pallido suberoso; hymenio subfulvo, poris punctiformibus acie obtusiusculis minimis.

On dead wood. Pileus hard, rigid, 1½ inch across, the older parts becoming smooth; margin thin; pores $\frac{1}{180}$ inch in diameter.

255. P. (INODERMEI) RADIATUS, *Fr. Ep.* p. 474. (195, 432.)

On erect dead trees. December. *Hab.* Venezuela, United States, Europe.

256. P. (INODERMEI) CHRYSITES, *B. Hook. Journ.* 1856, p. 233. (158, 397, 431, 435, 436, 437, 438, 439.)

On dead trees and logs in woods. November, January to April. Spores brown. *Hab.* Brazil.

257. P. (INODERMEI) RHEICOLOR, *B. & C.* (366.) Pileo subreniformi convexo postice in stipitem spurium desinente fibroso-sericeo lineato; contextu porisque parvis angulatis croceis, dissepimentis tenuibus.

On logs in thick woods. September. Pileus 2 inches wide, 1½ inch long, margin inflexed when dry; pores $\frac{1}{80}$ inch in diameter. Allied to *P. Splitgerberi.*

258. P. (INODERMEI) SPLITGERBERI, *Mont. Syll.* p. 164. (367, 427.)

On erect dead trees. August. *Hab.* Surinam, Mexico. "Golden yellow on the edge, shading to dark brown. Hymenium greenish

yellow." I have a specimen from Fries exactly agreeing with Montagne's plant.

The Cuba specimens have smaller pores, but they are young; and the pores are evidently broken up with age. Spores white.

259. P. (INODERMEI) IODINUS, *Mont. Syll.* p. 167. (192, 193, 448.)

On logs in thick woods. October. *Hab.* Guiana, Brazil, Venezuela.

260. P. (INODERMEI) PECTINATUS, *Kl. Linn.* vol. 8. p. 485. (430.)

On trees in woods. *Hab.* Hindustan.

261. P. (INODERMEI) HASKARTII, *Lev. Ann. Sc. Nat.* 1844 v. 2. p. 190. (429.)

On logs. December. *Hab.* Java, Neelgherries, Brazil. Pores much larger than in the last.

262. P. (INODERMEI) CIRRHIFERUS, *B. & C.* (441.) Rigidus, durus; pileo reniformi fibris cirrhiformibus dense vestito zonato rugoso caperato, margine lobato acuto; poris ferrugineis rotundis acie obtusis minutis.

On dead wood. Pileus 3 inches wide, 1¾ long; pores $\frac{1}{140}$ inch in diameter.

There is a short stem, but whether constant or no I have no means of determining.

The species, however, is so nearly allied to *P. caperatus*, though the coating is so different, that without more specimens I do not like to separate them. It is also allied to *P. linteus*, B., from Nicaragua.

263. P. (INODERMEI) CAPERATUS, *B. Ann. Nat. Hist.* vol. x. p. 391. (116, 128, 202, 340.)

On dead wood. *Hab.* Philippines, British Guiana, Brazil, Central America, Martinique, Hindustan.

264. P. (INODERMEI) CALCITRATUS, *B. & C.* (816.) Pileo durissimo dimidiato concentrice sulcato zonatoque umbrino, vallis subvelutino-spongiosis rugosis, margine acuto; hymenio subferrugineo, poris minimis punctiformibus; contextu umbrino.

On dead wood. Pileus 3¼ inches wide, 2½ long; pores $\frac{1}{180}$ inch in diameter. Allied closely to the last, but with much smaller pores. The name is intended to express the resemblance of the pileus to a road full of ruts and trampled over.

265. P. (INODERMEI) VIBRATILIS, *B. & C.* (159.) E resupinato margine breviter reflexo obtuso tomentoso gilvo-umbrino; poris minutis punctiformibus vibrantibus concoloribus et purpureo-umbrinis.

On dead wood. Pores $\frac{1}{150}$ inch in diameter. Substance purplish umber.

266. P. (Inodermei) holotephrus, *B. & C.* (352.) Luridus; pileo tenui coriaceo flabelliformi, e basi attenuata lineato, hic illic vinoso-tincto zonato, zonis alternis subtiliter velutinis scabris brunneis; poris 5–6-gonis brevibus minimis.

On dead wood. *Hab.* Guiana (Leprieur, no. 929). Pileus $2\frac{1}{2}$ inches broad, 2 inches long, radiato-lineate; pores $\frac{1}{200}$ inch in diameter. A very curious species.

267. P. (Inodermei) pallidocervinus, *Schwein. Syn.* p. 156; *Mont. Cuba*, p. 397. (131.)

On dead bark. *Hab.* United States.

268. P. (Inodermei) hirsutus, *Fr. Ep.* p. 477. (113, 122, 125, 209, 357, 358, 455.)

On logs in woods. *Hab.* Hindustan, Australia, New Zealand, Figi Isles, Borneo, Central America, United States, Europe, &c.

269. P. (Inodermei) arenicolor, *B. & C.* (454.) Pileo dimidiato postice decurrente papyraceo repetite zonato strigoso velutino pallido, margine lobato; poris parvis angulatis, dissepimentis tenuibus; hymenio ochraceo.

On logs in woods. Pileus 3 inches wide, $1\frac{3}{4}$ long. Pores $\frac{1}{100}$ inch across. Allied to *P. pinsitus* rather than to *P. hirsutus*.

270. P. (Inodermei) armenicolor, *B. & C.* (112.) Pileo tenui subcoriaceo flabelliformi in stipitem spurium attenuato zonato velutino interstitiis lineatis; hymenio alutaceo; poris minutis, dissepimentis tenuibus dentatis.

On dead wood. Pileus $2\frac{1}{2}$ inches across, $1\frac{3}{4}$ long; pores $\frac{1}{120}$ inch in diameter. The pileus is of a pale tawny or tan-colour, with darker lines. Allied to *P. versicolor*.

271. P. (Inodermei) versicolor, *Fr. Ep.* p. 478. (129.); *Mont. Cub.* p. 394.

On dead wood. *Hab.* Cosmopolitan.

272. P. (Inodermei) velutinus, *Fr. Ep.* p. 478; *Mont. Cub.* p. 396.

On dead wood. *Hab.* Philippines, New Zealand, Europe.

273. P. (Inodermei) myrrhinus, *Kicks, Mont. Cub.* p. 394.

On trunks of trees. *Hab.* Brazil, Guiana.

274. P. (Inodermei) pinsitus, *Fr. Ep.* p. 479; *Mont. Cub.* p. 390. (117, 118, 119, 450, 452.)

On dead wood. *Hab.* Guadeloupe, United States, British America.

This includes the forms with a white and dark hymenium, and also *P. arcticus*, Fr.

275. P. (INODERMEI) NEELGERRHENSIS, *Mont. Syll.* p. 164. (121.)

On dead wood. *Hab.* Hindustan, Upper Carolina, British North America below lat. 54° N.

276. P. (INÓDERMEI) ELONGATUS, *B. Hook. Lond. Journ.* 1842, p. 140. (109, 110, 111, 462, 463.)

Underside of logs in fields. June. "Spores white." *Hab.* Hindustan, Ceylon, Philippines, Java, Central America, Southern United States.

277. P. (INODERMEI) FLABELLUM, *Mont. Cub.* p. 388.

On dead branches and trunks.

278. P. (INODERMEI) LACERATUS, *B. Ann. Nat. Hist.* vol. iii. p. 393. (110, 460.)

On stumps in woods. November. "Hymenium yellowish." *Hab.* New Orleans.

279. P. (INODERMEI) SECTOR, *Ehrb. Hor. Phys. Ber.* p. 10; *Mont. Cub.* p. 389. (115, 130, 449, 453.)

On logs in dense woods. December, January. *Hab.* Tasmania, Brazil.

a. Var. SUBRUFUS, (458), Mont!

On logs in woods. January.

β. Var. SCHIZODES, (466.) **Pileo flabelliformi zonato subtiliter lineato, margine lobato-fisso, lobis crenatis; poris majoribus.**

γ. Var. CUBICOLA. (465.) **Pileo sericeo-nitente subzonato, margine lobato; hymenio brunneolo.**

On logs in woods. January.

δ. Var. ZONARIUS. (464.) **Pileo reniformi subflabellato subtiliter tomentoso lineato zonato glabrescente umbrino, margine integro; poris pallidis.**

Found also in Guiana=Leprieur, no. 960.

P. sector is a very variable species. The four varieties, but especially the last three, might almost be separated as distinct species.

280. P. (INODERMEI) SOBRIUS, *B. & C.* (107.) **Pileo imbricato flabelliformi opaco glaberrimo subzonato tenui umbrino-cinereo nebuloso; poris parvis laceratis.**

On dead wood. Pileus $\frac{3}{8}$ inch wide, $\frac{5}{8}$ inch long; pores $\frac{1}{84}$ inch in diameter.

Somewhat resembling *P. sector*, var. δ, but, I think, distinct.

281. P. (INODERMEI) MEMBRANACEUS, *Fr. Ep.* p. 481. (106, 461, 467, *Mont.*!)

On dead sticks. November. *Hab.* Mexico, Jamaica.

282. P. (INODERMEI) UNDIGERUS, *B. & C.* (457.) Pileo tenui submembranaceo dimidiato ochraceo concentrice sulcato, vallis subtiliter spongiosis; hymenio subconcolori; poris parvis angulatis subhexagonis acie tenuibus pruinatis.

On trunks in dense woods. February. Pileus 1½ inch broad, ¾ inch long; pores $\frac{1}{90}$ inch in diameter.

283. P. (RESUPINATI) OBLIQUUS, *Fr. Ep.* p. 482. (443.)

On erect dead trees. March. *Hab.* United States, Europe. The Cuba specimens have an olive tint, those from Ohio a chocholate-brown, and the Swedish ferruginous.

284. P. (RESUPINATI) FENDZLERI, *B. & C.* (389.) Margine tenui quandoque abrupto quandoque byssoideo; hymenio umbrino, poris minutis parvis sæpe interruptis obliquis acie pallidis.

On rotten logs. May. *Hab.* Venezuela.

Where the sides of the pores are exposed they are perfectly smooth. Pores $\frac{1}{120}$ inch in diameter, stalactitious.

285. P. (RESUPINATI) PALMICOLA, *B. & C.* (428.) Suborbicularis, flavo-ferrugineus, margine tomentoso sterili; poris mediis demum sinuatis, dissepimentis obtusis acie tomentosis.

On dead stipes of prickly palm. February. Pores $\frac{1}{40}$ inch in diameter.

286. P. (RESUPINATI) FERRUGINOSUS, *Fr.* p. 483. (184, 185.)

On dead wood. *Hab.* Australia, United States, Europe.

287. P. (RESUPINATI) OXYDATUS, *B. & C.* (390.) Late effusus, immarginatus; hymenio rufo, poris brevibus minutis, dissepimentis crassis obtusis angulatis sæpe collabentibus.

On the underside of old logs. April. Pores $\frac{1}{160}$ inch in diameter. *Hab.* South Carolina (no. 6175). The Cuba plant is less continuous.

288. P. (RESUPINATI) NEBULOSUS, *B. & C.* (444.) Subiculo tenuissimo pulveraceo ferrugineo; hymenio fusco, poris parvis brevissimis angulatis, dissepimentis tenuibus rigidis integris.

On decayed wood. Pores $\frac{1}{72}$ inch in diameter. Whole plant extremely thin.

289. P. (RESUPINATI) CARBONACEUS, *B. & C.* (204.) Latissime effusus, crassus, carbonaceus, contextu tenui umbrino; poris mediis elongatis, dissepimentis rigidis dentatis.

On logs. Many inches across; hymenium concentrically grooved. Pores $\frac{1}{30}$ inch in diameter. A fine species.

290. P. (Resupinati) cavernulosus, *B. Hook. Journ.* 1856, p. 236. (146, 149, 451.)

On dead branches. October. *Hab.* River Amazon. "Light brown."

291. P. (Resupinati) subliberatus, *B. & C.* (143, 394.) **Ochraceo-fulvus, margine tenui liberato; poris minutis elongatis angulatis, dissepimentis tenuibus subintegris pruinatis.**

On stumps of palms. June. "Light brown." Pores $\frac{1}{150}$ inch in diameter, but dilated in age.

292. P. (Resupinati) carneo-pallens, *B. Hook. Journ.* 1856, p. 237. (388.)

On dead wood. *Hab.* River Amazon.

293. P. (Resupinati) vulgaris, *Fr. Ep.* p. 485; *Mont. Cub.* p. 388. (153.)

On dead wood. *Hab.* Mauritius, United States, British America (Carlton House), Europe.

294. P. (Resupinati) vinctus, *B. Ann. Nat. Hist.* 1852. (144.)

On dead wood. *Hab.* St. Domingo.

295. P. (Resupinati) xantholoma, *Schwein. Syn.* no. 435. (395.)

On dead sticks. October. *Hab.* Lower Carolina.

296. P. (Resupinati) rivulosus, *B. & C.* (154.) **Candidus, effusus, carnosus (siccus contractus rimulosus), margine tenui tomentoso; poris mediis rotundis, dissepimentis crassis pruinosis.**

On dead *Polypori*. Margin at length more or less free. Pores $\frac{1}{60}$ inch in diameter.

297. P. (Resupinati) excurrens, *B. & C.* (391.) **Totus resupinatus, immarginatus, lignicolor; poris mediis subangulatis demum sinuosis, dissepimentis crassiusculis obtusis acie subtiliter tomentosis.**

Underside of old logs. April. Pores $\frac{1}{60}$ inch in diameter.

298. P. (Resupinati) vaporarius, *Fr. Ep.* p. 487. (145.)

On burnt logs. *Hab.* Swan River, Juan Fernandez, United States, Arctic America, Europe.

299. P. (Resupinati) ancectoporus, *B. & C.* (148.) **Totus resupinatus, margine tenuissimo; poris magnis hiantibus sæpe decurrentibus (siccis rufis), dissepimentis rigidis subacutis.**

On dead bark. Pores $\frac{1}{12}$–$\frac{1}{18}$ inch in diameter; their fructifying surface waxy.

14. Glœoporus, *Mont.*

300. G. conchoides, *Mont.*! *Cub.* p. 385, tab. xv. fig. 1. (194, 201, 574, 575, 322.)

On dead bark. *Hab.* British Guiana, South Carolina.

It would be easy to make three species out of the materials before me, differing in the clothing of the pileus and the colour of the hymenium. Montagne's plant was nearly smooth from age. In 194 the hymenium is dark; 201 is thick and resupinate. The thickness of the pileus varies in the same variety.

15. Trametes, *Fr.*

301. T. hydnoides, *Fr. Ep.* p. 490; *Mont. Cub.* p. 407. (212, 213, 214, 342,)

On logs in woods. December. *Hab.* Mauritius, Brazil, British Guiana, Jamaica, St. Domingo, Central America.

302. T. fibrosa, *Fr. Ep.* p. 490. (341.)

On fences. January.

303. T. ocellata, *B. & C.* (156, 440.) **Pileo dimidiato convexo rigido, setis compressis multiplicibus aspero; hymenio cinnamomeo, poris rotundis ocellatis.**

On logs in the field. February. Pores $\frac{1}{72}$ inch in diameter; larger than in *T. hydnoides*, partially covered when fresh with an evanescent membrane. Margin velvety.

304. T. hispidula, *B. & C.* (157.) **Parva, ungulæformis, umbrino-ferruginea; pileo postice hispido, margine subtomentoso; poris mediis acie pallidioribus, contextu concolori.**

On dead wood. Pileus $\frac{3}{4}$ inch wide, $\frac{1}{2}$ inch long; pores $\frac{1}{36}$ inch in diameter. A very distinct species.

305. T. aculeifera, *B. & C.* (147, 232.) **Læte umbrina; pileo aculeis rigidis multiplicibus subfasciculatis setoso, interstitiis spongioso tomentosis; poris mediis irregularibus acie tenuibus.**

On dead wood. Pileus scarcely an inch across; pores $\frac{1}{60}$ inch in diameter, often broken up; dimidiate or irregularly effused, sometimes quite sterile. Allied to *T. Lindheimeri*, B. & C., from Texas, and the Sikkim *T. ozonioides*, B.

306. T. versatilis, *B. Hook. Lond. Journ.* 1842, p. 150. (120.)

On dead wood. *Hab.* Philippines, Borneo, Brazil, New Orleans.

T. occidentalis, *Fr. Ep.* 491.—Polyporus occidentalis, *Mont.*! *Cub.*

p. 395.—P. byrsinus, *Mont.*! *Cub.* p. 395.—P. malacodermus, *Fr.* (127, 196, 197, 359, 364, 365, 418, 420.)

On logs in woods. *Hab.* Mauritius, Ceylon, Brazil, Guiana, Central America, Southern United States.

P. byrsinus, Mont., is, I believe, only a state with the pores imperfect and the down raised into crest-like ridges, and is the same with *P. malacodermus*, Fr. (nos. 364, 365).

307. T. RIGIDA, *B. & Mont. Syll.* p. 168. (126, 456.)

On dead wood. *Hab.* Brazil, St. Domingo, Southern United States. Often resupinate. This appears to be *P. Lundii*, Mont. Cub. p. 393, but whether of Fries, I am uncertain.

308. T. LACTINEA, *B. Ann. Nat. Hist.* vol. x. p. 373. (413.)

On dead wood. *Hab.* Ceylon, New England.

309. T. SPRUCEI, *B. Hook. Journ.* 1856, p. 236. (416.)

On dead wood. *Hab.* River Amazon.

310. T. PURA, *B. & C.* (321, 363.) Candida; pileo dimidiato con-convexo subtiliter tomentoso, margine obtuso; poris minimis acie obtusis pruinosis.

On dead bushes. September. Pure white. Pileus $1\frac{3}{4}$ inch wide, 1 inch long; pores $\frac{1}{150}$ inch in diameter. At first sight resembling the thicker forms of *Glœoporus conchoides*.

311. T. MULLERI, *Berk.* Pileo dimidiato suberoso subtiliter tomen-toso albo rugoso marginem versus lobatum concentrice sulcato; poris mediis, dissepimentis obtusis.

On dead wood. *Hab.* Victoria River, Australia, Brazil. Pi-leus 5 inches wide, 3 inches long; pores $\frac{1}{48}$ inch in diameter.

16. DÆDALEA, *P.*

312. D. SANGUINEA, *Kl. in Linn.* viii. p. 481; *Mont. Cub.* p. 382.

On trunks of trees. *Hab.* Hindustan.

313. D. AUREA, *Fr. Ep.* p. 493; D. discolor, *Mont.*! *Cub.* p. 381.

On trunks of trees. *Hab.* South Carolina, Europe. Battarra does not say that the substance of the fungus is yellow, as ap-pears in the specific character of Fries.

17. HEXAGONA, *Pollin.*

314. H. SERICEA, *Fr. Ep.* 497. (119.)

On dead wood. *Hab.* Mauritius, Southern United States.

Undoubtedly nearly allied to *P. pinsitus.* The pores, however, are larger and more rigid.

315. H. POLYGRAMMA, *Mont. Cub.* p. 379. (325.)
On logs. October. *Hab.* Hindustan, Ceylon, Cape of Good Hope, Mexico, Martinique.

316. H. VARIEGATA, *B.* (227.) *Ann. Nat. Hist.* vol. x. p. 280.
On dead wood. *Hab.* Central America, British Guiana, St. Domingo, Jamaica, Key West, Vera Cruz.

18. FAVOLUS, *Fr.*

317. F. PRINCEPS, *B. & C.* (324.) Pileo reniformi subcarnoso subtiliter tomentoso fulvo, margine tenui (sicco inflexo); stipite sursum dilatato subcylindrico velutino fulvo; alveolis brevibus angulatis decurrentibus fuscis.
On dead wood. August. Pileus $3\frac{1}{2}$ inches wide, $2\frac{1}{2}$ long; stem 1 inch high, $\frac{3}{4}$ thick above; alveoli $\frac{1}{36}$ inch in diameter, at length elongated. A noble species.

318. F. PURPURASCENS, *B. & C.* (223, 318, 319.) Pileo flabelliformi lævi vel leviter aculeato antice luride purpureo, margine tenui (sicco inflexo); stipite brevi plus minus hispido; alveolis amplis pileo pallidioribus stipitem versus albis, acie tenui laceratis.
On logs in woods, often coming out from the crevices. January. Pileus $1\frac{1}{2}$ inch broad, 1 inch long; stem $\frac{1}{4}$ inch long, 2 lines thick.

319. F. BRUNNEOLUS, *B. & C.* (327.) Pileo tenui flabelliformi in stipitem brevem spurium postice angustato, sicco ruguloso; alveolis minoribus hexagonis brevibus brunneolis.
On dead wood. Pileus 1 inch across, nearly as much long; alveoli $\frac{1}{48}$ inch in diameter. A very distinct species.

320. F. BRASILIENSIS, *Fr. Ep.* p. 498; *Mont. Cub.* p. 377. (215.)
On dead wood. *Hab.* Brazil, Sikkim, Surinam, Texas.

321. F. TESSELLATUS, *Mont.*! *Syll.* p. 171. (220, 317, 320.)
On rotten logs in woods. January. *Hab.* Guiana, St. Domingo. Spores white.

322. F. CUCULLATUS, *Mont.*! *Cub.* tab. xiv. fig. 2. (222, 323, 326.)
On dead wood. May. *Hab.* St. Domingo, South Carolina.

323. F. FRIESII, *B. & C.* (217.) *F. lacerus*, Fr. Pileo tenui hyalino flabelliformi postice attenuato; stipite cylindrico tomentoso; alveolis amplis decurrentibus.
On dead wood. *Hab.* Costa Rica, Mexico. The name of *F. lacerus* is already occupied by Léveillé for a Java species.

324. F. HISPIDULUS, *B. & C.* (219, 221, 216, 218, 315, 316.) Pileo tenui reniformi postice lineato hispido reticulato, antice subtiliter

tomentoso tessellato, margine tenuissimo pellucido quandoque fimbriato; stipite brevi cylindrico hispidulo; alveolis amplis elongatis.

On logs in woods. December. Pileus 2½ inches broad, 1½ long; stem ⅙–⅓ inch long; alveoli $\frac{1}{18}$ inch in diameter. White when fresh.

19. LASCHIA, *Fr.*

325. L. SUBCÆRULEA, *B. & C.* (332, 333.) **Pileo tenuissimo infundibuliformi pallide cæruleo; stipite verticali gracili; poris amplis pileo concoloribus.**

On logs. August. Pileus ½ inch across; stem ¼ inch long, not ½ a line thick.

In this and the following seven species, the vertex is more or less elongated, and the hymenium superior as in *Peziza.*

326. L. AURISCALPIUM, *Mont.*! *Syll.* p. 172. (330.)

On the petioles of Palm-fronds. June. *Hab.* Cayenne. Deep orange; stem hollow; pores ample.

327. L. INTERMEDIA, *B. & C.* (225.) **Minute; pileo galeæformi saccharino-pruinoso; stipite brevi laterali; poris paucis irregularibus acie pruinosis.**

On Palm-petioles. Whole plant scarcely a line long. Intermediate between *Laschia* and *Auricularia.*

328. L. PEZIZOIDEA, *B. & C.* (224.) **Pileo orbiculari vertice affixo; poris subrotundis parvis, dissepimentis crassis pruinosis.**

On herbaceous stems. About a line across; pores $\frac{1}{80}$ inch across. Probably orange-coloured when fresh.

329. L. CINNABARINA, *B. & C.* (226.) **Cinnabarina, orbicularis, resupinata, vertice stipitiformi affixa; poris brevibus angulatis pallidioribus.**

On dead bark. About a line across; pores $\frac{1}{48}$ inch in diameter. A very beautiful little species.

330. L. PURPUREA, *B. & C.* (329.) **Pileo orbiculari purpureo, centro umbilicato, vertice elongato gracili stipitiformi affixo; poris parvis flexuosis.**

On logs. June. Pileus ⅓–½ inch across; stem nearly half an inch high; spores broadly elliptic, white; pores $\frac{1}{48}$ inch in diameter.

331. L. CURTISII, *B.* (572, 335.) **Pileo orbiculari infundibuliformi, vertice in stipitem sursum incrassatum elongato; poris subrotundis angulatis.**

On dead wood. Pileus ½ inch across, margin umber. We have

no notice as to the colour of the species, which, however, is clearly distinct from the last, the pores being very different.

332. L. PENSILIS, *B. & C.* (328.) **Pileo orbiculari, vertice in stipitem brevem cylindricum elongato; poris flexuosis, interstitiis venosis.**

On dead wood. Pileus $\frac{1}{3}$–$\frac{1}{2}$ inch across, rufous when dry. Pores very irregular.

333. L. ALBA, *B. & C.* (334.) **Orbicularis, alba, tota resupinata; poris parvis angulatis radiantibus.**

On sticks in woods. "White. Hymenium with 2–3 rays and irregularly areolate by radiating and concentric laminæ." December.

334. L. CÆRULESCENS, *B. & C.* (573.) **Orbicularis, resupinata; hymenio subcæruleo; poris irregularibus compositis.**

On dead bark. About $\frac{1}{2}$ inch across. Pores running into one another, compound as in *L. tremellosa.*

335. L. TREMELLOSA, *Fr.* (571, 337.)

On dead wood. December. *Hab.* Hindustan, Ceylon, Brazil, Venezuela, Mexico, Java, St. Domingo. "Dark reddish." Spores white, copious.

20. MERULIUS, *Hall.*

336. M. SPADICEUS, *B. & C.* (186.) **Pileo flabelliformi libero zonato spadiceo fibris innatis subtiliter virgato, margine lobato; poris collabentibus concoloribus.**

On sticks, mosses, &c. In habit resembling *Guepinia.* Pileus 2 inches long, $1\frac{3}{4}$ broad.

337. M. RUGULOSUS, *B. & C.* (245.) **Effusus, resupinatus, pallide ochraceus, margine lobato; hymenio irregulari; alveolis amplis curtis irregularibus.**

On a rotten erect stick. February. At first commencing its growth in little orbicular patches, which at length become more or less confluent. Allied to *M. corium*, but quite distinct.

21. POROTHELIUM, *Fr.*

338. P. CUBENSE, *B. & C.* (152.) **Effusum, tomentosum, albidum, immarginatum; poris ocellatis curtis stictiformibus.**

On dead wood. At first consisting of little tomentose pimples, which gradually become confluent and open at the apex. The tomentose, not waxy rimose subiculum, distinguishes it from *P. Friesii,* while the immarginate patches separate it from *P.*

fimbriatum and *lacerum*, and the inseparable mass and short pores from *P. pezizoides*.

339. P. REVIVISCENS, *B. & C.* (151, 257, 309, 310.) Placentiforme, umbrinum, reviviscens, subspongiosum; poris margine albo subquadrato verrucæformi cinctis.

On bark of living trees. *Hab.* Louisiana. Forming little patches an inch or two across, with an abrupt darker edge marked with lines of growth after the fashion of *Polyporus australis*.

The hymenium at first is studded with little warts which, in miniature, resemble those of *Lycoperdon gemmatum*, and at length have a minute orifice leading into a cylindrical pore. It is *Stereum Halei*, no. 3360, from Louisiana, of Dr. Curtis's United States communications.

22. FISTULINA, *Bull.*

340. F. HEPATICA, *Fr. Ep.* p. 504. (406.)

On the roots of a tree blown down by the wind. *Hab.* Sikkim, Pennsylvania, Europe.

23. HYDNUM, *L.*

341. H. HIRNEOLOIDES, *B. & C.* (299.) Gelatinosum, subpellucidum; pileo reniformi pallide brunneo hispidulo; stipite excentrico basi incrassato hispido; hymenio albido; aculeis subulatis acutissimis.

On rotten wood. July. Pileus an inch or more across; stem $\frac{3}{4}$ inch high, $\frac{1}{3}$ thick at the base. Allied to *H. gelatinosum*. Sometimes sessile.

342. H. PLUMARIUM, *B. & C.* (205.) Album (siccum ochraceum); pileo ex infundibuliformi fisso-palmato fimbriatoque lineato depresso tomentoso subzonato; stipite gracili tomentoso; aculeis brevibus obtusis hic illic complanatis; hymenio quandoque subporoso.

On sticks in woods. July. Stem $\frac{3}{4}$ inch long; pileus $1\frac{3}{4}$ long and broad.

Closely allied to *Hydnum palmatum*, Hook., which equals it in size, but has a dark pileus and still more porous hymenium. By an error of the press, lines have been substituted for inches in Kunth's 'Synopsis.' We have two closely allied species collected by Sallé in Brazil.

343. H. FLAVUM, *B. Ann. Nat. Hist.* vol. x. p. 380. (237, 305, 306, 348.)

On sticks and dead bushes. January, May. *Hab.* Jamaica, Venezuela.

A closely allied species occurs in Venezuela, *H. brunneo-leucum*, B. & C.: pileo tenui galeæformi; stipite brevissimo affixo brunneolo; hymenio tomentoso albo.

344. H. FLABELLIFORME, *B. Hook. Lond. Journ.* 1845, p. 306. (235.)

On dead wood. *Hab.* Sikkim, United States.

345. H. RENIFORME, *B. & C.* (301.) **Pileo reniformi zonato subtiliter tomentoso lineatoque nitido ochraceo-umbrino, margine tenui (sicco inflexo), aculeis subulatis acutissimis umbrinis.**

On logs in thick woods. January. "Light brown below, darker above." Pileus sometimes subcuneiform, 1½ inch across.

346. H. DECURRENS, *B. & C.* (234, 297.) **Imbricatum, postice decurrens, confluens, album, exsiccatum pallidum; pileo rugoso sulcato-zonato irregulari tomentoso; hymenio hic illic sterili; aculeis subulatis acutis.**

On dead erect trunks. February. Two or three inches across by confluence. No. 234 appears to be a freer form of the same species, and is more sulcate, and the hymenium not interrupted, which, indeed, is not the case in the non-decurrent portion.

347. H. OCHRACEUM, *P. Syn.* p. 559. (298.)

Underside of logs. October. *Hab.* Juan Fernandez, United States, Europe.

348. H. CLAVARIOIDES, *B. & C.* (238.) **Subiculo crassiusculo tomentoso alutaceo; aculeis hic illic congestis fuscis coralloideis flexuosis obtusis subramosis.**

On dead wood. A very singular species.

349. H. SATURATUM, *B. & C.* (331.) **Effusum, separabile, spongiosum, aquosum, subfulvum; aculeis minutis brevibus obtusis concoloribus; interstitiis farinaceis.**

On rotten wood. March. Saturated like a sponge with water, and becoming thin and tawny when dry. Aculei in parts radiating from a common point, sometimes jagged, at first forming something like merulioid pores towards the margin, which when a little advanced look like the papillæ of a *Porothelium*, and are finally Hydnoid.

350. H. ALUTACEUM, *Fr. Ep.* p. 516. (233.)

On dead wood. *Hab.* Europe.

351. H. LAMINIFERUM, *B. & C.* (307.) **Effusum; subiculo tenuis-**

simo, margine angusto albo arachnoideo; aculeis ochraceis compressis apice pruinoso-plumosis.

On dead bushes. March. Allied to the last, but with very different aculei, resembling those of an *Irpex*.

352. H. PYRAMIDATUM, *B. & C.* (239.) **Albidum, effusum; aculeis fasciculatis in cumulos pyramidatos congestis, plus minus connatis, acutissimis.**

On bark. Aculei disposed as in *Radulum quercinum*.

353. H. FARINACEUM, *P. Syn.* p. 562. (231.)

On pith of a dead Palm. *Hab.* United States, Europe.

24. IRPEX, *Fr.*

354. I. MAXIMUS, *Mont. Ann. Sc. Nat.* 2e sér. viii. p. 364.—Polyporus labyrinthicus, *Mont.* ! *Cub.* p. 406. (123, 124.)

On dead wood. *Hab.* St. Domingo. The plant of Schweinitz belongs to the Anodermous *Polypori*, while this, if a *Polyporus*, would be associated with the Inodermei. An authentic specimen shows that Montagne's species is very different from that of Schweinitz.

355. I. CUBENSIS, *B. & C.* (240.) **Pileo reniformi cervino glabro lineato, margine rotundato cirrhoso; hymenio concolori; aculeis compressis.**

On dead wood. About half an inch across. There was another species in the first collection, no. 508, distributed as *Irpex cæspitosus*, the specimens of which are destroyed by insects.

356. I. TRACHYODON, *B. & C.*—Hydnum trachyodon, *Lév. Ann. Sc. Nat.* 1846, v. 5. p. 302. (241.)

On dead wood. *Hab.* Bogota.

25. GRANDINIA, *Fr.*

357. G. TOMENTOSA, *B. & C.* (311.) **Pallida, effusa, margine arachnoideo cito obliterato, granulis minutissimis tomentosis.**

On bark. May.

358. G. ACCUMULATA, *B. & C.* (228.) **Alba, crassiuscula, rimosa, granulis primum distinctis, demum numerosissimis accumulatis, margine angusto submembranaceo.**

On bark. A very nearly allied species, with more minute granules and a very narrow white farinaceous margin, occurs in Venezuela.

26. Grammothele, *B. & C.*

Hymenium poroso-reticulatum sulcatumve; ubique granulis asperum.

359. G. lineata, *B. & C.* (314.) Alba, effusa, resupinata, margine tenuissimo farinaceo, sulcis longis linearibus; granulis apice farinaceis.

On erect dead trees. February. Spreading very widely. The genus combines the characters of *Hymenogramme* and *Grandinia.*

360. G. polygramma, *B. & C.* (211, 312.) Alba, effusa, resupinata, immarginata, sulcis brevibus linearibus plus minus reticulatis.

On erect dead trunks. December. *Hab.* Brazil. Very different from the last, with less distinctly linear furrows.

361. G. grisea, *B. & C.* (393.) Effusa, grisea, immarginata; hymenio poroso.

Underside of logs in woods. June.

362. G. mappa, *B. & C.* (308.) Effusa, pallida, resupinata, margine brevi farinaceo candido; hymenio rimoso; poris minutis.

Lowerside of logs. March.

27. Kneiffia, *Fr.*

363. K. gelatinosa, *B. & C.* (230.) Effusa, arctissime adhærens, venosa, gelatinosa, pallida, papillis minutis farinosa.

On bark. Resembling *Phlebia* in habit; but the minute papillæ, which have frequently little setiform appendages at their apices, bring it under *Kneiffia.* It perhaps may form a distinct genus, when *Hydnum gelatinosum* is separated.

364. K. fulva, *B. & C.* (313.) Ferrugineo-fulva, effusa, resupinata, margine hispido, granulis minutis, setulis tandem obliteratis.

On dead wood. Spreading for several inches; remarkable for its hispid margin.

365. K. Wrightii, *B. & C.* (229.) Effusa, tenuis, citrino-fulva, margine angusto pallidiore citrino farinaceo; granulis apice evidenter setulosis.

On dead wood.

366. K. grisea, *B. & C.* (493.) Longe effusa, immarginata, pallide cinerea, ligno arctissime adhærens.

On dead wood. Agreeing in colour with *Grammothele grisea,* and connecting it with *Kneiffia,* the granules being so disposed as to form extremely minute pores.

28. Craterellus, *Fr.*

367. C. spathularius, *B. & C.* (3.) Minutus; pileo obliquo spathulato luteo saccharino stipiteque sursum concolore deorsum a basi orbiculari oriundo obscure glabrescentibus; hymenio sublævi.

On dead wood. Stem with the pileus 1½ line high. Closely allied to the genus *Skepperia.*

368. C. marasmioides, *B. & C.* (32.) Pileo excentrico rugoso glabro rufo, margine inflexo; stipite e rhizomate repente oriundo deorsum incrassato nigro; plicis crassis venosis.

On dead ferns. Pileus 1 line across; stem 2 lines high, resembling somewhat that of a *Didymium.*

369. C. pulverulentus, *B. & C.* (564.) Pallide ferrugineus; pileo orbiculari pulverulento, margine inflexo; stipite deorsum incrassato nigro; hymenio parce venoso, pileo concolori.

On bark of sticks. Pileus 1 line across; stem 1¼ line high, resembling, as in the last, that of a *Didymium.*

29. Cladoderris, *P.*

370. C. dendritica, *P. in Freyc. Voy.* t. 1. f. 4. (279.)

On dead wood. *Hab.* Rawak, Brazil, Rio Janeiro, Philippines, Hindustan, River Amazon. "Spongy at the base and full of water."

30. Thelephora, *Fr.*

371. T. caperata, *Berk. & Mont. Syll.* p. 175. (509, 290.)

On logs in woods. June. *Hab.* Brazil, St. Domingo.

372. T. aurantiaca, *P. in Freyc. Voy.*; *Mont.* ! *Cub.* p. 376. (512, 296.)

On dead wood. *Hab.* St. Domingo.

373. T. sericella, *B. & C.* (531, 237.) Pallida; pileo cyathiformi subzonato sericeo nitido tenui papyraceo lineato-striato, margine plus minus crenato; stipite brevi cylindrico tomentoso; hymenio pileo concolori lævi vel subrugoso setuloso.

Dead woods in ravines. November. Pileus about an inch across, sometimes lateral; stem densely downy at the base, sometimes obsolete.

374. T. decolorans, *B. & C.* (234, 248.) Alba (sicca ochracea); pileo cyathiformi-flabelliformi zonato lineato striato; stipite tomentoso; hymenio glabro.

On trees in woods. May. Stem sometimes nearly obsolete. Nearly allied to the last; but the hymenium is not setulose. Occasionally the edge is deeply fringed.

375. T. AFFINIS, *B. & C.* (198, 263.) Pileo flabelliformi subzonato fibris innatis vel marginem versus liberis lineato-striato plicato in stipitem tomentosum attenuato, margine fimbriato.

On decayed wood. Thicker than the two last, more strongly striate.

376. T. QUISQUILIARIS, *B. & C.* (519.) Pusilla; pileo cyathiformi vel flabellato tomentoso inæquabili striatulo candido; stipite brevi sursum incrassato; hymenio subplicato pubescente.

On particles of bark, &c., amongst moss. Pileus 2–3 lines across; stem 2 lines high.

377. T. RADICANS, *B.* (209.) *Hook. Lond. Journ.* 1844, p. 190.

On the ground or very decayed wood. *Hab.* Surinam, Java.

378. T. ANASTOMOSANS, *B. & C.* (280.) Alba (sicca pallida), multifida; ramis ramulisque connatis sursum subflabelliformibus fimbriatis, deorsum plus minus distinctis vel in stipitem communem confluentibus.

On stumps. October. About an inch high. Allied to the Mexican *T. craspedia*, Fr.

379. T. DENTOSA, *B. & C.* (507, 238.) E resupinata merismoidea, ochracea, deorsum rufo-brunnea, margine dentato; hymenio lævi, perfecto rufo-brunneo.

On rotten wood, leaves, and other vegetable matter. Spreading over the surface, and giving off distinct branches, which are sometimes dilated in a flabelliform manner above, after the manner of *T. mollissima*; sometimes the hymenium is perfected where it runs over the leaves. The name applies better to 507, which has been distributed; 238 is more like *T. palmata*.

380. T. UMBRINA, *Fr. Ep.* p. 543. (221.)

On bark. *Hab.* United States, Europe.

381. T. ALBO-MARGINATA, *Schwein.* (249.) *Hook. Lond. Journ.* 1847, p. 324.

On bark. *Hab.* United States, as far north as Ohio.

382. T. MURRAII, *B. & C.* (269.) Effusa, carnoso-crustacea, margine angusto tomentoso pallido, hymenio rimoso granulato ex albido subcarneo-griseo.

Bark of living trees. May. "Greyish or light-brownish." *Hab.* New England, no. 5809.

383. T. PEDICELLATA, *Schwein. Syn.* p. 108. (535, 798.)

On living bushes. February. *Hab.* New Zealand, Southern United States.

384. T. RETIFORMIS, *B. & C.* (288, 214.) **Subiculo dense tomentoso umbrino; hymenio reticulato pulverulento griseo.**

On bark. Allied to the last; but the subiculum is quite different; and the reticulated hymenium (after the fashion of *Trichia*) no. 214 is quite sterile.

385. T. SPONGIA, *B. & C.* (566.) **Late effusa, radians; subiculo crasso lacunoso spongioso-fibroso fusco, apice decolori; hymenio fusco fragmentitio umbrino.**

On bark. Spreading for many inches. Analogous to *Polyporus trichomallus*. The fibres are decumbent, not erect as in *T. pedicellata*.

31. LACHNOCLADIUM, *Lév.*

386. L. BRASILIENSE, *Lév. Ann. Sc. Nat.* 1846, v. 1. p. 159. (556.)
On fragments of wood &c. *Hab.* Brazil.

387. L. FURCELLATUM, *Lév.* (276.) *Ann. Sc. Nat.* 1846, v. 5. p. 159.

On rotten wood in thick forests. Pale yellow. *Hab.* Surinam, Brazil, River Amazon.

388. L. CARTILAGINEUM, *B. & C.* (204.) **Subcartilagineum; stipite cylindrico gracili sursum repetite ramoso; ramis cylindraceis, apicibus acutissimis hic illic opacis.**

On the ground. October. About 1½ inch high. A very distinct species.

32. STEREUM, *Fr.*

389. S. ELEGANS, *Fr. El.* p. 545. (243, 255, 270.)

On logs in woods. *Hab.* Australia, Tasmania, New Zealand, Essequibo, River Amazon, Southern United States.

390. S. RIVULORUM, *B. & C.* (533.) **Minutum, stramineum; pileo cyathiformi in stipitem sursum dilatatum decurrente, margine undulato; hymenio glabro.**

On wet ground amongst moss. Pileus ¾ line across; stem 1½ line high, oblique but not really lateral. Habit of a small stipitate *Peziza*.

391. S. GLABRESCENS, *B. & C.* (520.) **Pileo flabelliformi zonato castaneo subtiliter velutino glabrescente striatulo, margine pallidiore crenato-lobato, postice in stipitem brevissimum lateralem angustato; hymenio concavo ochraceo.**

On dead wood. Pileus 1¼ inch wide, 1 inch long; rough behind, with a few aculeiform processes.

392. S. PUSIOLUM, *B. & C.* (510.) **Minutum, rufo-brunneum, flabel-**

liforme, postice in stipitem brevissimum attenuatum; pileo convexo subtiliter tomentoso lineato-rugoso; hymenio lævi.

On rootlets. Whole plant 1½ line high; stem spurious. Contracted when dry.

393. S. CYPHELLOIDES, *B. & C.* (511.) Parvum, pallide ochraceum; pileo flabelliformi subzonato subtiliter depresso-tomentoso rugoso-striato in stipitem brevem spuriumve angustato; hymenio lævi.

On the ground amongst moss. The largest specimen ¼ inch wide, 2 lines long.

394. S. LOBATUM, *Fr. Ep.* p. 547. (523, 197, 259, 271.)

On logs in woods. January, June. "Spores white." *Hab.* Hindustan, Ceylon, Australia, Tasmania, New Zealand, Java, Surinam, Brazil, River Amazon, United States as far as Ohio.

395. S. SPRUCEI, *B.* (521, 522.) Pileo subflabelliformi vertice affixo repetite zonato multicolori e spongioso-tomentoso glabro, fortiter lineato-rugoso.

On dead wood. *Hab.* Peru, River Amazon, Brazil, Xalapa.

396. S. VERSICOLOR, *Fr. Ep.* p. 547. (291.)

On dead wood. *Hab.* United States.

397. S. FASCIATUM, *Fr. Ep.* p. 546. (289, 293.)

On logs. January. *Hab.* North America as far as Upper Canada, Caucasus.

398. S. MEMBRANACEUM, *Fr. Ep.* p. 547. (240.)

On rotten logs in woods. November. *Hab.* Guiana, Xalapa.

399. S. COMPLICATUM, *Fr. Ep.* p. 548. (524, 527, 281, 229, 231.)

On twigs and branches. December. *Hab.* Mexico, United States, British North America. No. 231 is thicker and strigose behind; but these plants vary so much that I do not like to propose it as a distinct species.

400. S. PAPYRINUM, *Mont.*! *Cub.* p. 374. (516, 517, 518, 547, 548, 216, 257, 274.)

Underside of logs and on dead trees. December, March. "Dark purple." Sometimes resupinate. *Hab.* Ceylon, New Zealand, South Africa, Brazil, St. Domingo, South Carolina, Central America. *Thelephora crassa*, Lév.!, seems to be the same species.

401. S. SULPHURATUM, *B. & Rav.* (292.) Pileo reflexo lobato crispato sulphurato hispido subspongioso; hymenio pallido undulato.

On dead sticks. *Hab.* Venezuela, South Carolina, Rav. n. 1731.

The sulphur tinge sometimes vanishes in drying. Pileus ½–1 inch or more across. A very pretty species.

402. S. HIRSUTUM, *Fr. Ep.* p. 459. (285, 295.)

On twigs, logs, &c. November, January. *Hab.* Hindustan, Australia, Tasmania, New Zealand, Venezuela, Mexico, United States, British North America, Europe.

403. S. BICOLOR, *Fr. Ep.* p. 549. (514.)

On dead wood. *Hab.* Sikkim, United States up to the Ohio, Europe.

404. S. VIBRANS, *B. & C.* (530.) Centro affixum, orbiculare, coriaceum, rigidum; pileo ferrugineo zonato velutino nec striato; hymenio umbrino cinnamomeoque vibrante zonato.

On dead wood. Analogous to *Hymenochæte veluticeps*, B. & C. Pileus 2 inches broad.

405. S. SCYTALE, *B. Hook. Journ.* 1854, p. 170. (515.)

On dead wood. *Hab.* Sikkim, Khasia, Brazil.

406. S. TRISTE, *B. & C.* (251, 252.) Orbiculare, margine tantum libero; pileo sursum ezonato tomentoso fusco; hymenio rugoso pruinoso; umbrino contextu fusco.

On stumps in woods. May. About an inch across. Margin of hymenium sterile when young.

407. S. COFFEARUM, *B. & C.* (247.) Pileo leviter reflexo zonato tenui hispidulo cinereo; hymenio rugoso pruinoso brunneolo; contextu umbrino.

On coffee-trees. March.

408. S. FERREUM, *B. & C.* (199). Effusum, durum, rigidum, coffeatum, stratosum, margine elevato sublobato; hymenio hic illic colliculoso glabro; contextu umbrino.

On the lower side of leaning trees in woods. March. Allied to *S. subpileatum*, B.; border, where free, grooved, nearly smooth; hymenium not rimose.

409. S. PRUINATUM, *B. & C.* (193). Effusum, rimosum, margine tenuissimo; contextu ferrugineo-fusco; hymenio subcinereo pruinoso.

On logs in woods and fields. January. Not separable as *S. ferreum* and its allies.

410. S. SERIATUM, *B. & C.* (538, 283.) Disciforme, tandem elevatum; hymenio albo, senio cinnamomeo pruinoso, latere elevato spadiceo.

On trees. October. Nearly allied to *S. candidum*, but a very different-looking species.

411. S. STRUMOSUM, *Fr. Nov. Symb.* p. 95. (536, 218, 273.)

On branches of trees and dead wood. November, January. *Hab.* Mexico, South Carolina. Staining the paper salmon-colour. Sent with *S. strumosum* under the name of *S. sulfureum*.

412. S. ACERINUM, *Fr. Ep.* p. 553. (223.)

On bark. *Hab.* Hindustan, Tasmania, South Carolina, Europe.

33. MICHENERA, *B. & C.*

Placentæformis, disco ceraceo; sporis magnis limoniformibus longe pedicellatis.

413. M. ARTOCREAS, *B. & C.* (262.) *Curt.* no. 5609.

On dead trunks of trees. *Hab.* United States. On Black Oak. From ¼ to ¾ inch across; margin raised, white-tomentose; hymenium cracked, umber, resembling that of *Corticium ochroleucum*. Spores, including the stem, ·0025 inch long; without the stem, ·001.

34. HYMENOCHÆTE, *Lév.*

414. H. DAMÆCORNIS, *Lév. Ann. Sc. Nat.* Fév. 1846. (201, 203, 210, 267, 272.)

On roots of trees and amongst fallen leaves in thick woods. January, March, October. *Hab.* Brazil, St. Domingo, River Amazon. This includes *H. reniformis*, which is merely a simple form connected by many intermediate states.

415. H. VELUTICEPS, *B. & C.* (236, 264, 302, 303, 304, 445.) Dimidiata, dura, coriacea, sulcato-zonata, velutina, glabrescens; pileo brunneo; hymenio stratoso pallide cinnamomeo, setis fasciculatis.

On logs in woods, often on the underside. May, July. The fasciculate setæ, at first sight, make it look like an *Hydnum* allied to *H. flavum*.

416. H. CACAO, *B.* (*sub* Stereo), *Hook. Journ.* 1864, p. 169. (526.)

On dead wood. *Hab.* Khasia, Venezuela.

417. H. SALLEI, *B. & C.* (278.) Pileo papyraceo ferrugineo repetite zonato pilis decumbentibus sericeo-velutino plicato, margine lobato; hymenio spadiceo antice crocato.

On sticks in woods. January. *Hab.* Cordova. Pileus 2 inches broad, 1½ inch long.

418. H. TENUISSIMA, *B.* (528, 531, 275, 284.)

On sticks and rotten logs in woods. October, December. *Hab.* Hindustan, Ceylon, Mexico, South Carolina.

419. H. RUBIGINOSA, *Lév. l. c.* (540.)

On dead wood. *Hab.* Tasmania, Hindustan, New Orleans, South Carolina, Ohio, Europe.

420. H. ASPERA, *B. & C.* (211, 277.) **Rubiginosa; pileo dimidiato imbricato zonato innato-fibroso, fibris fasciculatis postice reticulatis; hymenio colliculoso aspero.**

On rotten logs in woods. October, December. *Hab.* Venezuela. 2 inches or more across; pileus very rough, resolved behind into a reticulate mass of fibres. Hymenium resembling the pileus of *Polyporus scruposus.*

421. H. RIGIDULA, *B. & C.* (529.) **Effuso-reflexa, rigidula, sursum zonata, velutina, spadicea; hymenio vinoso ferrugineo inæquabili.**

On dead wood. Spreading for some inches; margin narrow, lobed; lobes rounded.

422. H. DURA, *B. & C.* (241.) **Resupinata, orbicularis, crassa, rigida, ferrugineo-rhabarbarina, margine obtuso; hymenio lævi.**

On dead erect trees. February. Allied to *H. corticolor*, B. & Rav. No. 1553 on elm.

423. H. LEONINA, *B. & C.* (532.) **Tota resupinata, croceo-ferruginea, margine tomentoso; hymenio inæquabili inseparabili nec rimoso.**

On dead wood. Spreading for several inches.

424. H. SIPARIA, *B. & C.* (220.) **Resupinata; subiculo racodioideo umbrino, filamentis intertextis; hymenio inæquabili subconcolori.**

On dead wood. 1 or 2 inches across. Analogous to *Thelephora spongia.*

425. H. MUSCICOLA, *B. & C.* (253.) **Subiculo gilvo tenui subtiliter byssoideo; hymenio concolori, margine angusto demum evanido albo.**

On dead branches of trees covered with moss. July. Allied to *H. cervina.*

426. H. PAUPERCULA, *B. & C.* (542.) **Parva, orbicularis, gilva, margine juniore pallidiore, adulto elevato; hymenio lævi.**

On Congo Bean. At first forming little orbicular patches a line or two across, which at length become more or less confluent, but not to the extent of more than ½ an inch. Allied to *H. cervina.*

427. H. CERVINA, *B. & C.* (213.) **Tota resupinata, effusa, tenuis, margine tomentoso cito obliterato; hymenio cervino.**

On bark of trees in woods. February. Resembling resupinate forms of *Stereum Curtisii*, B. & C.

428. H. FRUSTULOSA, *B. & C.* (225, 244.) **Tota resupinata, primum**

sinuato-reticulata, demum frustulosa, ferrugineo-flava, margine obsoleto.

On bark of small trees and on bushes. February, March.

429. H. FULIGINOSA, *Lév. l. c.* (188, 268 pro parte.) **Tota resupinata, irregularis, tenuis, margine ferrugineo tomentoso; hymenio fusco-umbrino.**

On the smooth end of trunks from which timber has been sawn. December. *Hab.* Venezuela, Europe. The Cuba plant is separable, perhaps, from growing amongst moss.

430. H. TOMENTOSA, *B. & C.* (228.) **Resupinata, effusa, immarginata, ferrugineo-rufa, tota e tomento molli oriunda.**

On wood, forming a bright thin clothing.

431. H. UNICOLOR, *B. & C.* (541.) **Adnata, resupinata, crassiuscula, rigida, cinnamomea, lævis, æquabilis, rimosa, margine leviter pulvinato; intus e basi badia concolor.**

On dead trees, spreading for several inches.

35. AURICULARIA, *Bull.*

432. A. LOBATA, *Fr. Ep.* p. 555. (576, 190, 294.) *Mont.*! *Cub.* p. 373.

On bark. *Hab.* Mexico, River Amazon, Central America, British Guiana, Europe.

36. CORA, *Fr.*

433. C. PAVONIA, *Fr. Ep.* p. 566. (565, 192, 246.)

On trees. February, January. Varying from white to bluish white. *Hab.* Hindustan, Surinam, West Africa, Martinique.

37. DICTYONEMA, *Nees v. Es.*

434. D. SERICEUM, *Mont. Bél. Voy.* p. 155 (*sub* Dichonemate). (242.)

On bushes. February. *Hab.* —— ?

435. D. SPONGIOSUM, *B. & C.* (191.) **Imbricatum, dimidiatum; pileo pallide fulvo poroso-spongioso non zonato; hymenio concolori subzonato.**

On stumps. January. Pileus 3 inches across. The distinctive cracked hymenium well developed. A far finer species than *D. sericeum.*

38. CORTICIUM, *Fr.*

436. C. OCHROLEUCUM, *Fr. Ep.* p. 557. (250.)

On bark of living trees. April. *Hab.* Tasmania, Venezuela, Southern United States, Europe.

437. C. LÆVE, *Fr. Ep.* p. 560. (549.)

On dead wood. *Hab.* Tasmania, Vera Cruz, Nepal, New Zealand, Southern United States, Europe.

438. C. SACCHARINUM, *B. & C.* (569.) **Effusum, resupinatum, ochraceo-umbrinum, margine pallido hic illic libero fimbriato; hymenio subreticulato.**

On dead wood. Allied to *C. giganteum*. Like *Merulius rugulosus*, it oscillates between *Corticium* and *Merulius*; but that is allied to *Merulius corium*, this to *C. giganteum*.

439. C. OCHTHODES, *B. & C.* (570.) **Effusum, resupinatum, umbrino-fulvum, margine crenato subtomentoso; hymenio colliculoso.**

On dead wood. This, like the last, is anomalous: young specimens have the hymenium nearly even; in age it becomes rough, and sometimes the papillæ are elongated. *Thelephora puteana*, however, shows us how a species with a normally even hymenium may become covered with cerebriform processes.

440. C. INCONSPICUUM, *B. & C.* (544.) **Pallidum, resupinatum, effusum, margine crenato tomentoso; hymenio subreticulato.**

On dead wood. Scarcely exceeding ½ inch in breath, resembling in some of its characters *C. saccharinum*; but the substance is quite different.

441. C. CINEREUM, *Fr. Ep.* p. 563. (447.)

On bark &c. *Hab.* Southern and Northern United States, British North America, Europe.

442. C. TEPHRUM, *B. & C.* (539, 546.) **Resupinatum, effusum, margine pallide rufo crenato libero tomentoso; hymenio hic illic papillato gilvo-cinereo (demum rimoso).**

On dead wood. The more perfect state is described above; a form occurs without the rufous margin.

443. C. AUBERIANUM, *Mont.*! *Cub.* p. 372.

On dead wood. *Hab.* Southern United States.

444. C. INCARNATUM, *Fr. Ep.* p. 564. (260.)

Underside of rotting logs. July. *Hab.* United States, British North America, Europe.

445. C. CITRINELLUM, *B. & C.* (484.) **Orbiculare, resupinatum, citrinum, margine tenuissimo pulveraceo-arachnoideo; hymenio granulato pulverulento.**

On bark. Forming little lichenoid patches, scarcely ¼ inch broad.

446. C. MOLLE, *B. & C.* (202.) **Resupinatum, effusum, immarginatum, armeniacum; subiculo pallidiore; hymenio glaberrimo nitido.**

Underside of logs in woods. March. Looks like a thin coating of wax poured over the surface. *Hab.* Southern United States, No. 2936, Curt.

447. C. SUBCONTINUUM, *B. & C.* (537.) **Effusum, ochraceum, immarginatum, læve, glabrum, intus brunneum, reviviscens.**

On bark. Spreading for several inches. Cracked, apparently from the splitting of the matrix.

448. C. SIMILE, *B. & C.* (543.) **Effusum, pallidum, immarginatum, sinuato-rimosum, glabrum, intus brunneum, crusto flavo insidens; margine tenuissimo.**

On bark. Spreading for several inches. Resembling somewhat resupinate states of *C. læve*. The yellow mycelium is so incorporated with the bark, that we hesitate somewhat about its real nature.

39. GUEPINIA, *Fr.*

449. G. SPATHULARIA, *Fr. Ep.* p. 566; *Mont. Cub.* p. 370. (553.)

On dead wood. *Hab.* Hindustan, Surinam, Ceylon, New Zealand, Brazil, South Carolina, Texas.

450. G. FISSA, *B. Ann. Nat. Hist.* x. p. 383. (554.)

On dead wood. *Hab.* Guiana, Ceylon, River Amazon, Sincapore.

451. G. PALMICEPS, *B. l. c.* (555, 195.)

Cracks in logs. December. *Hab.* Ceylon.

40. CYPHELLA, *Fr.*

452. C. MUSÆCOLA, *B. & C.* (751.) **Pileo crucibuliformi pallide purpureo brevissime stipitato sessilive, extus tomentoso; hymenio luteo.**

On sheaths of Plantain-leaves. About a line across.

453. C. PALMARUM, *B. & C.* (753.) **Alba; pileo cyathiformi, extus subtiliter pruinoso; stipite brevi tomentoso crassiusculo.**

On petioles of Palms. June. Scarcely a line high; stem rather thick for the size of the pileus, often oblique.

41. HYPOCHNUS, *Ehb.*

454. H. HOLOXANTHUS, *Mont. Cub.* p. 367.

On bark.

455. H. ALBO-CINCTUS, *Mont.*! *Cub.* p. 368. (200.)

On bark. *Hab.* New Zealand, River Amazon, Venezuela, Louisiana.

456. H. NIGRO-CINCTUS, *Ehb. Hor. Phys. Ber.* p. 85; *Mont. Cub.* p. 369.

On bark. *Hab.* River Amazon.

457. H. RUBRO-CINCTUS, *Ehb. l. c.*; *Mont.* ! *Cub.* p. 369. (567.)

On bark. *Hab.* Brazil, Surinam, Venezuela, Southern United States. We have specimens from Rio Janeiro, running over Algæ, from the walls of an aqueduct.

42. CLAVARIA, *L.*

458. C. CYANOCEPHALA, *B. & C.* (261.) **Stipite subdiviso, ramis ramulisque furcatis sursum intense cæruleis, apicibus breviter bifidis obtusis subfastigiatis.**

Among leaves in thick woods. June. *Hab.* Bonin Isles. About 3 inches high.

459. C. CERVINA, *B. & C.* (235.) **Pallide cervina, cæspitosa, ramosissima; ramis subdivaricatis axillis inferioribus lunæformibus, apicibus elongatis acutis obscurioribus.**

On dead wood.

460. C. PALLIDA, *B. & C.* (256.) **Dendroides; stipite brevi tomentoso sursum diviso, ramis repetite furcatis gracilibus, apicibus acutissimis.**

On dead wood. July. Scarcely 2 inches high. This and the last are very closely allied, and approach *Lachnocladium.*

461. C. PYXIDATA, *P. Comm.* t. 1. f. 1. (230.)

On dead sticks. December. Exactly according with Persoon's figure. *Hab.* Europe.

462. C. BRUNNEOLA, *B. & C.* (239.) **Helvola; stipite cylindrico tenui parce diviso; ramis 1–2 furcatis, ultimis longis obtusis cylindricis patentibus.**

On banks. November. About 1 inch high.

463. C. LÆTICOLOR, *B. & C.* (226.) **Simplex, intense aurantiaca, cylindrica, obtusa, basi pallidior; stipite indistincto.**

On earth in woods. November. Scarcely 1 inch high.

464. C. CLARA, *B. & C.* (557.) **Simplex, deorsum attenuata, pallide aurantiaca, semipellucida, gracilis, cylindrica, subacuta; hymenio cum basi continuo.**

On the ground. About an inch high.

465. C. FLAVELLA, *B. & C.* (561.) **Simplex, gracilis, flavida, cylindrica, acuta, hymenio cum basi angustata confluente; sicca opaca, striata.**

On the ground. About an inch high.

466. C. INÆQUALIS, *Fr. Ep.* p. 577. (258, 265.)

Amongst leaves in woods. July. *Hab.* New Zealand, Tasmania, United States, Europe.

467. C. misella, *B. & C.* (222.) **Alba, simplex, clavata, obtusa; stipite tenui, basi spongiosa dilatata.**

Attached to Mosses. Not exceeding ½ inch in length; opake when dry. Nearly allied to *C. paupercula*, B. & C., a species from Venezuela, which also grows on moss, but is pellucid and rugose when dry.

43. Calocera, *Fr.*

468. C. stricta, *Fr. Ep.* p. 581. (254.)
On rotting sticks. June. Yellowish. *Hab.* Europe.

469. C. flagelliformis, *B. & C.* (207.) **Stipite cylindrico, ramis paucis strictis flagelliformibus acutissimis.**
On bark of dead trees. October.

44. Typhula, *Fr.*

470. T. muscicola, *Fr. Ep.* p. 585. (559.)
On moss. *Hab.* Southern United States, Europe.

471. T. tenuissima, *Curt. in Sill. Journ.* 1848, p. 350. (563.)
On dead leaves. *Hab.* South Carolina (No. 1358), Venezuela.

472. T. subulæformis, *B. & C.* (562.) **Candida, filiformis, acutissima, basi orbiculari tomentosa affixa.**

On bark. About ¾ inch high. Sometimes two or three individuals grow from the same base, which then looks like *Corticium læve*.

45. Pistillaria, *Fr.*

473. P. quisquiliaris, *Fr. Ep.* p. 587. (552.)
On dead leaves. *Hab.* Europe.

474. P. pusilla, *Fr. Ep.* p. 587. (551.)
On stems of herbaceous plants. *Hab.* Europe.

475. P. subpellucida, *B. & C.* (783.) **Alba, subpellucida, linearis, leviter clavata, basi subincrassata.**

On Fern-stems. December. Only very slightly clavate. Not 1 line high.

476. P. cupressiformis, *B. & C.* (560.) **Stipite brevi setiformi nigro; capitulo cupressiformi griseo pulverulento.**
On twigs. About a quarter of a line high.

46. Hirneola, *Fr.*

477. H. Auricula Judæ, *Fr.* (219, 336.)

On dead wood. *Hab.* Tasmania, Port Famine, Brazil, River Amazon, Borneo, Mexico, United States, Europe.

478. H. fusco-succinea, *Mont.*! *Cub.* p. 364.

On dead wood.

479. H. auriformis, *Fr. Fung. Nat.* p. 26.—H. Lesueurii, *Lév.* (286.)

On dead wood. *Hab.* Sikhim, River Amazon, Southern United States.

480. H. polytricha, *Fr. Fung. Nat.* p. 26.—Exidia polytricha, *Mont.*! *Cub.* p. 365. (577, 206, 266.)

On dead trees. October. *Hab.* Ceylon, Mexico, Brazil. No. 206, has softer hairs.

481. H. blepharistoma, *B. & C.* (578.) Pileo conchiformi velutino luteo-fusco, margine setis conspicuis ciliato; hymenio plicato atro.

On dead wood. The marginal cilia at once distinguish it from the last.

482. H. Wrightii, *B. & C.* (581.) Pileo primum obliquo, demum erecto, cupulæformi, extus stipiteque velutinis rufis; hymenio concolori lævi.

On dead wood. Looking much like a *Peziza*, but with the true fruit of *Exidia*; spores curved, 3-septate, $\frac{1}{150}$ inch long.

483. H. minuta, *B. & C.* (362.) Cyathiformis, subspadicea, demum uno latere hians, subtiliter velutina, glabrescens; hymenio nigro; stipite cylindrico hispidulo.

On dead wood. About $\frac{1}{4}$ of an inch high.

47. Tremella, *Fr.*

484. T. fuciformis, *B.* (233.) *Hook. Journ.* 1856, p. 277.

On rotting wood. September. "Pale yellow." *Hab.* River Amazon.

485. T. rufo-lutea, *B. & C.* (217.) Cerebriformis, sordide rufolutea, rugoso-lobata, uno puncto affixa.

On dead wood. March. About $1\frac{1}{2}$ inch across, 1 inch high. "Red dirt-yellow."

486. T. Janus, *B. & C.* (232, 579.) Luteo-fusca, sursum lævis, deorsum rugoso-lobata, margine leviter crenato-plicato.

On erect (dead?) trees. December. 2 inches or more across.

487. T. WRIGHTII, *B. & C.* (194, 529 pro parte.) Pallide fusca, parce palmato-lobata, lobis obtusis.

On sticks. December.

48. CORYNE, *Fr.*

488. C. VINOSA, *B. & C.* (804.) Vinosa, fusiformis, compressa, rugosa, capitulo parvo concolori.

On rotten logs in thick woods. February. "Dark reddish." Conidia minute, most abundant. About 2 lines high, single or fasciculate.

On a Collection of Fungi from Cuba. Part. II., including those belonging to the Families Gasteromycetes, Coniomycetes, Hyphomycetes, Physomycetes, and Ascomycetes. By the Rev. M. J. BERKELEY, M.A., F.L.S.

[Read January 16, 1868.]

ON examining the collection of Cuban Hymenomycetes, which comprised 489 species, characters of which were, on a former occasion, laid before the Linnean Society, it appeared that, neglecting decimals beyond one point, of the whole Collection

	per cent.
The species belonging to Cuba formed	57·0
Those common to it with the neighbouring islands and continent	13·9
Those common to it with the United States exclusively	3·2
Those found in Europe as well as the United States	13·2
Those of wide distribution	12·4
Total	99·7

An examination of the species belonging to the remaining families gives nearly the same results—

	per cent.
Species peculiar to Cuba	54·6
Common to it with the neighbouring islands and continent..	10·2
Common to it with the United States, excluding Europe	5·3
Common with Europe and United States	13·2
Species of wide distribution	16·0
Total	99·3

So that, taking the whole collection, which consists of 888 species, we have—

	per cent.
Peculiar species	55·8
Contiguous islands and continent	11·1
United States, excluding Europe	4·1
European and United States	13·1
Widely distributed	14·9
Total	99·0

At least a fourth of the species are those of temperate climates; and as regards the rest, they may be considered for the most part characteristic of subtropical rather than tropical regions.

Of those which have a wide range, 40 are found in Europe; so that 23·3 per cent. (or 93) of the species now described are European; and taking the Hymenomycetes also into consideration, of which 75 are European, we have on the whole 18·9 per cent. of species identical with those of Europe.

Contrasting this with collections from other countries, we have

	per cent.
In Tasmania	48·0
In New Zealand	34·1
In the Philippine isles	5·0
In Java	33·3

A former estimation of European species in Cuba at 25·0 per cent. is reduced 6 per cent. by an examination of the present collection.

The number of genera is large with reference to species, but, perhaps, not more so than in a European flora.

As regards the distribution through the year, we cannot expect it to be the same with that of Hymenomycetes. In that case the number of species was greatest in December and January; with respect to the other families, February produced, within two, as many as December and January, while June and July together gave two more than February. May, on the contrary, yielded very few. Without an exact acquaintance with the comparative rainfall or humidity in different months, and in the absence of all information as to the height at which the specimens were gathered, it would be useless to attempt to explain the discrepancy.

GASTEROMYCETES.

PHALLOIDEI.

DICTYOPHORA, *Desvx.*

489. DICTYOPHORA SPECIOSA, *Kl. in Nov. Act.* xix. *Suppl.* i. p. 239, tab. 6.—Phallus Dæmonum, *Rumph. Fl. Amb.* xi. p. 131. (718.)

On the ground. September. *Hab.* Ceylon, Java, Taiti, Guiana, Japan, Ohio.

490. D. PHALLOIDEA, *Lév. in Act. Linn. Soc. Paris*, v. p. 507, t. 13. (717.)

On the ground in woods. November. *Hab.* Japan.

CLATHRUS, *Mich.*

491. CLATHRUS CANCELLATUS, *L. Syst.* p. 1017. (715, 719.)

On the ground. *Hab.* Hindustan, Khasia, Ceylon, Algiers, Europe.

492. C. CRISPUS, *Turp. Iconog. Champ.* f. 2. (713, 714.)

On rotten wood in Palm-forests. June. *Hab.* St. Domingo, Maldonado.

LATERNEA, *Turp.*

493. LATERNEA TRISCAPA, *Turp. Iconog.* f. 2. (245, 711.)

In sandy Pine-woods. December. *Hab.* Chili.

In one of the specimens there are four columns, in the other three; but one of these latter is forked below and then united above, so as to form a large mesh, thus making a decided approach to *Clathrus*. Colour pale vermillion.

494. L. PUSILLA, *B. & C.* Minima, costis duabus sursum crispis coccineis hymenophoro conjunctis, deorsum candidis; volva candida. (712.)

On the ground. Whole plant scarcely an inch high.

TRICHOGASTRES.

GEASTER, *Mich.*

495. GEASTER TENUIPES, *B. in Hook. Lond. Journ. Bot.* vi. p. 576; *Bot. Ant. Voy. Tasm.* tab. 183. f. 9. (694.)

On the ground or on rotten wood. September. *Hab.* Tasmania.

496. G. SACCATUS, *Fr. Syst.* iii. p. 16. (687, 688, 690, 692.)

On the ground. *Hab.* Tasmania, Maldonado, Venezuela, Bra-

zil, United States, Canada. All the Cuban specimens belong to a smaller form.

497. G. FIMBRIATUS, *Fr. Syst.* iii. p. 16. (248, 689, 691.)

On the ground. *Hab.* Australia, Tasmania, New Zealand, Car. Inf., Europe. Two forms occur in Cuba, a larger and a smaller.

498. G. MIRABILIS, *Mont. Syll.* p. 286. (246, 695, 696.)

On rotten wood and on sticks. February, June. *Hab.* Ceylon.

DYPLOCYSTIS, *B. & C.*

E strato communi oriunda. Peridium duplex; exterius coriaceum, pateræforme, ore magno quasi circumscisso apertum; interius membranaceum, ore parvo ciliato. Capillitium laxum. Sporæ globosæ.

499. DIPLOCYSTIS WRIGHTII, *B. & C.* (697.)

Apparently on rotten wood. Densely gregarious; outer peridium ⅛ of an inch across, resembling a *Peziza* when empty; margin slightly jagged, probably open from an early stage of growth; interior delicately filamentous, opening somewhat after the fashion of *Geaster fimbriatus*; flocci and globose spores (·00025 of an inch in diameter) pale umber.

TULOSTOMA, *P.*

500. TULOSTOMA EXASPERATUM, *Mont.*! *Cub.* p. 317, tab xi. fig. 4. (247, 709, 710.)

On earth. No. 710 is far smoother than the other specimens. *Hab.* Neilgerrhies.

LYCOPERDON, *Tourn.*

501. LYCOPERDON PYRIFORME, *Schæff.* t. 189. (251, 255, 256, 257, 701, 703, 707, 708.)

On dead wood or on the ground. August, October, December. *Hab.* Hindustan, Tasmania, New Zealand, Venezuela, United States, Arctic America, Europe.

502. L. CÆLATUM, *Fr. Syst.* iii. p. 32. (698.)

On the ground. *Hab.* Hindustan, Australia, Car. Inf., Rocky Mountains, Europe.

503. L. PUSIO, *B. & C.* Parvum, globosum, glabrum, siccum corrugatum, astomum; capillitio sporisque minoribus globosis lævibus atropurpureis; mycelio copiosissimo. (253.)

On dead wood. Peridium ⅓ inch across; mycelium filmy, with intermixed threads penetrating deeply.

504. L. RUGOSUM, *B. & C.* **Peridio hemisphærico astomo tomentoso, deorsum rugoso-plicato, in stipitem brevem spurium subradicantem desinente; basi sterili magna convexa cum capillitio confluente; sporis luteis glabris.** (700.)

On the ground. *Hab.* Ceylon.

505. L. OBLONGISPORUM, *B. & C.* **Sessile, subglobosum, astomum, pallide fuscum, aculeis minutis asperum; capillitio concolori; sporis oblongis.** (252.)

Amongst dead leaves. About an inch in diameter. Spores oblong, rather attenuated at either end, ·00025 inch long. Distinguished from all other species by the peculiar spores.

506. L. FULIGINEUM, *B. & C.* **Peridio subgloboso vel obovato fuligineo, basi pallidiore; ore dentato, demum aperto, subtiliter tomentoso; capillitio sporisque echinulatis pallidis.** (705.)

On rotten logs. October. An inch or more in diameter.

507. L. RUBELLUM, *B. & C.* **Sessile; peridio obovato rufo, squamulis minutis furfuraceis hispido; capillitio sporisque globosis lævibus majoribus umbrinis.** (706.)

On wood. Peridium ½ an inch across. Mycelium thread-like, penetrating deeply into the wood.

508. L. EPIXYLON, *B. & C.* **Sessile; peridio hemisphærico astomo rufo subtiliter furfuraceo; capillitio sporisque globosis hispidis argillaceis.** (249.)

On dead wood, into which the mycelium penetrates deeply. Peridium ½–1 inch across. Resembling the last in colour, but not in form or in the spores, which are echinulate and much larger.

509. L. TEPHROSPERMUM, *B. & C.* **Sessile; peridio crasso coriaceo globoso pallido verrucis minutis tomentosis aspero; capillitio sporisque minoribus asperulis fuscis.** (250, 254.)

On the ground. Mycelium ample, filmy, and filamentous, white.

510. L. TURBINATUM, *B. & C.* **Peridio turbinato umbrino glabro irregulariter rupto, deorsum in radicem elongatam desinente; capillitio sporisque globosis lævibus argillaceis.** (704.)

On rotten wood in dense forests. December. Peridium 1½ inch across.

HIPPOPERDON, *Mont.*

511. HIPPOPERDON CRUCIBULUM, *Mont.*! *Cub.* p. 319.

On the ground in woods.

Scleroderma, *P.*

512. Scleroderma tenerum, *B. & C.* **Peridio globoso tenero luteo, squamis pyramidatis apice planis vestito, stellatim dehiscente; stipite brevi vel obsoleto; mycelio membranaceo luteo; sporis atro-purpureis.** (702.)

Amongst moss. December. About half an inch across.

NIDULARIACEI.

Cyathus, *Tul.*

513. Cyathus intermedius, *Tul. Ann. d. Sc. Nat.* 1844, i. p. 72, tab. 4. figs. 4–7.—Nidularia intermedia, *Mont.*! *Cub.* p. 321. (685.)

On dead sticks. July. *Hab.* Mauritius.

514. C. Montagnei, *Tul. l. c.* i. p. 70, tab. 4. figs. 9–11. (243.)

On the ground. Spores ·0008 inch long. *Hab.* Brazil.

515. C. limbatus, *Tul. l. c.* p. 78. tab. 4, figs. 12–17. (240, 682, 683.)

On earth and rotten wood. July, December. *Hab.* Sierra Leone, Bahia, Guiana, River Amazon. Spores ·0007 inch long by ·00025 wide. This was sent from Sierra Leone as the nest of a small Bee.

516. C. Pœppigii, *Tul. l. c.* p. 77, tab. 4. figs. 23–25.

On the ground. Mr. Lea. *Hab.* Venezuela, Guiana.

517. C. pallidus, *B. & C.* **Utero campaniformi squamis erectis stuppeis vestito, fibris apicalibus junctis; margine vix striato; sporis subglobosis.** (684.)

On dead wood. Spores ·0004 inch in diameter.

518. C. microsporus, *Tul. l. c.* p. 73, tab. 6. figs. 6–8. (244.)

On the ground. *Hab.* St. Domingo, Rio Janeiro. Spores ·00028 inch long.

519. C. Lesueurii, *Tul. l. c.* p. 79, tab. 5. figs. 5–13. (686.)

On the chaff of Coffee. August. Spores ·001 inch long, nearly as much broad. We have a variety gathered by Mr. Wright in Connecticut, no. 5652, with larger spores, ·0013 inch long.

MYXOGASTRES.

Lycogala, *Mich.*

520. Lycogala epidendrum, *Fr. Syst.* iii. p. 80; *Mont. Cub.* p. 316.

On dead wood. *Hab.* Hindustan, Ceylon, New Guiana, Veraquaz, Car. Inf., Saskatchawan, Europe.

RETICULARIA, *Bull.*

521. **RETICULARIA PYRRHOSPORA**, *B.* **Crassa, pulvinata, rubro-ferruginea; floccis stuppeis lutosis; sporis obovatis hic illic breviter pedicellatis peroxydatis.** (676.)

On trees. January. *Hab.* Mauritius, River Binné. Two inches or more in diameter. Spores obovate, ·0005—·0006 inch long.

522. R. **AFFINIS**, *B. & C.* **Effusa, tenuis, papillosa, atropurpurea, margine tenui; sporis oblongis; capillitio brevi ramoso.** (454.)

On bark and standing dead trees. *Hab.* Car. Inf. Spreading for one or two inches, thinner than the following species, with the spores longer and more or less elliptic or oblong. No. 3012, Car. Inf., is a form of the same species, but with fewer of the spores oblong. Spores ·0004–·00025 inch long.

523. R. **ATRO-RUFA**, *B. & C.* **Effusa, atro-rufa, lævis nec superficie reticulata; floccis brevibus crassiusculis cylindricis; sporis atro-rufis subglobosis.** (534.)

On bark. Spreading for three or four inches; margin abrupt; spores reddish by transmitted light, ·0002 inch in diameter.

524. R. **VENULOSA**, *B. & C.* **Effusa; peridio murino-purpureo venis remotis notato; sporis fuligineo-purpureis subellipticis; floccis remotis.** (675.)

On mosses. December. Purple, spreading for several inches. Less dusty than some other species. Spores of the same size as in the last.

ÆTHALIUM, *Lk.*

525. **ÆTHALIUM SEPTICUM**, *Fr. Syst.* iii. p. 93; *Mont. Cub.* p. 315. (273, 274.)

On dead wood, with white and yellow flocci. *Hab.* New Zealand, Venezuela, United States, Europe.

DIDERMA, *P.*

526. **DIDERMA CUBENSE**, *B. & C.* **Adnatum, irregulare; peridio exteriore crasso fragili albo, interiore obsoleto; columella umbrina; capillitio albo; sporis fuligineis.** (797.)

On dead leaves. July. Agreeing in many respects with *D. difforme*; but it is rather adnate than sessile; the interior peridium is adnate with the outer; the columella is of the same form as

the peridium, and not globose, and the spores are not all umber-coloured.

DIDYMIUM, *Schrad.*

527. DIDYMIUM COSTATUM, *Fr. Syst.* iii. p. 118. (667.)
On dead leaves with *Strigulæ*. *Hab.* Tasmania, Car. Inf., Europe.

528. D. FARINACEUM, *Fr. Syst.* iii. p. 119. (455, 483.)
On old bark-rope. *Hab.* Car. Inf., Europe. No. 455 is an imperfectly developed state.

529. D. RADIATUM, *B. & C.* Hypothallo orbiculari radiato-costato stipiteque sulcato sursum attenuato pallide cinereis; peridio lentiformi nec umbilicato, pruinoso-nigro; floccis fuligineis. (733.)
On leaves of grass. The spores are not perfectly developed; but the hypothallus, which exactly resembles the base of *Agaricus stylobates*, is very peculiar.

530. D. PRUINOSUM, *B. & C.* Hypothallo obsoleto; stipite curto, deorsum nigro-costato; peridio hemisphærico umbilicato albo partiticulis candidis pruinoso; capillitio candido; sporis atris; columella nulla. (269.)
On dead stems of some monocotyledonous plant.

531. D. POLYMORPHUM, *Mont.*! *Cub.* p. 314. (270.)
On decayed bark.

532. D. OBRUSSEUM, *B. & C.* Hypothallo tenuissimo scarioso; stipite aureo deorsum incrassato hyalino; peridio albo vel citrino; floccis candidis; sporis atris. (664, 799.)
On leaves, mosses, &c. *Hab.* Texas, on *Gonolobus*. Peridium umbilicate.

533. D. TENERRIMUM, *B. & C.* Peridio globoso candido subtus umbilicato venuloso; hypothallo obsoleto; stipite elongato deorsum incrassato pallido hyalino; floccis candidis; sporis atris. (267.)
On leaves of grass, nearly allied to the last.

534. D. CRUSTACEUM, *Fr. Syst.* iii. p. 124; *Mont. Cub.* p. 313.
On bark of dead trees. *Hab.* Europe.

535. D. CINEREUM, *Fr. Syst.* iii. p. 126. (679.)
On dead wood. *Hab.* Madras, Ceylon, New Zealand, Car. Inf., Europe, Venezuela.

CRATERIUM, *Trentepohl.*

536. CRATERIUM LEUCOCEPHALUM, *Dittm. St. Deutsch. Fl.* t. 11. (455.)

On grass. *Hab.* Europe. The specimens differ from the ordinary form in separating at the base, after the manner of an *Arcyria*, and in their very small size. In other respects the species agrees with *C. leucocephalum.* The specimens are too few to justify us in separating the form as a species, especially as the operculum is not present.

DIACHEA, *Fr.*

537. DIACHEA ELEGANS, *Fr. Syst.* iii. p. 156. (268, 271, 495, 665.)

On grass, fern, &c. *Hab.* Ceylon, Car. Inf., Europe.

STEMONITIS, *Gled.*

538. STEMONITIS FUSCA, *Roth. Fl. Germ.* i. p. 448; *Mont.*! *Cub.* p. 312. (261, 671.)

On bark. *Hab.* Ceylon, Tasmania, New Zealand, Venezuela, Texas, United States, Canada, Europe.

539. S. FERRUGINEA, *Ehb. Sylv. Ber.* p. 25. tab. v. (668.)

On bark. *Hab.* Ceylon, New Zealand, St. Domingo, Car. Inf., Europe.

540. S. TYPHOIDES, *DC. Fr.* ii. p. 257. (266.)

On bark. *Hab.* Java, New Zealand, Car. Inf., Europe, Algeria.

ARCYRIA, *Hill.*

541. ARCYRIA CINEREA, *Fr. Syst.* iii. p. 180. (502.)

On sticks. December. *Hab.* Venezuela, United States, Europe. With no. 502 is an abortive *Marasmius. Stemonitis digitata*, Schwein.! herb.

542. A. BICOLOR, *B. & C.* **Gregaria; peridiis oblongis; stipite basique peridii nigris; capillitio sporisque pallide ochraceis.** (672.)

On sticks. Stem as long as the capillitium; threads minutely echinulate.

543. A. NUTANS, *Fr. Syst.* iii. p. 180. (258, 262.)

On leaves &c. *Hab.* Swan River, Car. Inf., Europe. The dingy form of the species.

OPHIOTHECA, *Currey.*

544. OPHIOTHECA WRIGHTII, *B. & C.* **Peridio annulari firmo badio; floccis aculeatis; sporis luteis subangularibus.** (673.)

On dead wood. Spores smooth or very obscurely granulated,

·0004 inch long. We have another species of this curious genus, from Upper Carolina, no. 413, on dead stems of herbaceous plants, which may be characterized:—*O. pallida*, B. & C., peridiis flexuosis pallidis; floccis luteis nodulosis minute echinulatis; sporis globosis. The flocci are very irregular in outline, and have far shorter processes than the other two species. Spores ·0004 inch in diameter.

TRICHIA, *Hall.*

545. TRICHIA RUBIFORMIS, *P. Disp.* p. 54; *Fr. Syst.* iii. p. 183. (681.)

On dead wood. *Hab.* Quito, Tasmania, Venezuela, United States, Europe.

546. T. PYRIFORMIS, *Hoffm. Veg. Cr.* ii. p. 1; *Fr. Syst.* iii. p. 184. (263, 680.)

On dead wood. *Hab.* Ceylon, Venezuela, Quito, United States, Europe.

547. T. CLAVATA, *P. Obs.* ii. p. 34; *Fr. Syst.* iii. p. 186. (259.)

On dead wood. *Hab.* Car. Inf., Europe.

548. T. VARIA, *P. Obs.* ii. p. 32; *Fr. Syst.* iii. p. 188. (264.)

On dead wood. *Hab.* Tasmania, Europe.

549. T. TURBINATA, *With.* vol. iv. p. 480; *Fr. Syst.* iii. p. 187. (260.)

On dead wood. *Hab.* Europe, Car. Sup.

550. T. SERPULA, *P. Syn.* p. 181; *Fr. Syst.* iii. p. 188. (265.)

On dead wood. *Hab.* Bombay, Ceylon, Europe. Spores ·00057–·0005 in diameter.

LICEA, *Schrad.*

551. LICEA STIPITATA, *B. & Ravenel.* Stipite communi crasso sulcato; peridiis in caput hemisphæricum conglomeratis; sporis læte umbrinis cymbiformibus. (677, 678.)

On dead wood. *Hab.* Car. Inf., no. 1305. Stems 2 lines high and thick; spores shaped like the seeds of a Veronica, ·00929 inch long. The spores in *L. fragiformis* are globose and ·00028 inch in diameter.

CONIOMYCETES.

SPHÆRONEMEI.

ACTINOTHYRIUM, *Kze.*

552. ACTINOTHYRIUM CUBENSE, *B. & C.* Peritheciis latissime conicis quandoque confluentibus e cellulis radiantibus medio compactioribus constructis; sporophoris longis; sporis filiformibus quandoque curvatis. (408.)

On the upper surface of leaves.

LEPTOTHYRIUM, *Kze.*

553. LEPTOTHYRIUM PASSIFLORÆ, *B. & C.* Maculis pallidis; peritheciis parcis irregularibus subpunctiformibus; sporis oblongis utrinque obtusis hyalinis. (359.)

On the hairy upper surface of the trilobate leaves of some Passion-Flower, the hairs of which are partially obliterated on the spots. Spores ·0006 inch long by ·0002 wide.

SPHÆRONEMA, *Fr.*

554. SPHÆRONEMA CAMINA, *B. & C.* Peritheciis carbonaceis elongato-conicis basi confluentibus. (333.)

On the dead stems of some Endogen. Perithecia about a line high. Unfortunately there are no spores; but it is so near *S. spinæforme*, B. & C., from Alabama, no. 5118, which has extremely minute globose spores, that we have no hesitation in referring the specimens to the genus, in which it is one of the most striking species.

DIPLODIA, *Fr.*

555. DIPLODIA VULGARIS, *Lév. Ann. d. Sc. Nat.* May 1846, p. 291. (791, 793.)

On dead stems of Congo-bean, with *Fusarium pallidum*. *Hab.* Car. Inf., Europe.

556. D. CONSOCIATA, *B. & C.* Peritheciis ovatis, collo brevi, basin versus floccis brevibus vestitis; sporis minutis. (With *Sphæropsis undulata*, 550, 554.)

On dead bark of logs in fields. July. Spores oblong, ·0005 inch long.

ASCHERSONIA, *Mont.*

557. ASCHERSONIA CUBENSIS, *B. & C.* Stromate pallido convexo obtuso carneo pruinoso, apice leviter umbilicato quandoque basi dilatata; sporis fusiformibus acuminatis. (427.)

On the underside of the fronds of some *Pteris*. *Hab.* River Amazon. Spores ·0004 inch long.

558. A. BASICYSTIS, *B. & C.* **Stromate breviter elevato apice plano pallide cervino e strato orbiculari oriundo brevissime stipitato; stipite cellulifero. (766.)**

On dead leaves. About a line across. Upper part of the stroma composed of radiating cells which pass below into loose thicker threads, towards the edge of which are the fructifying cells. No. 787 has the same species on leaves from swamps mixed with a tufted *Scytonema*.

ACROSPERMUM, *Tode*.

559. ACROSPERMUM COMPRESSUM, *Tode, Meck. Fung.* i. p. 8. (811.)

On dead stems of *Cucurbitaceæ*. February. *Hab.* United States. Europe.

SPHÆROPSIS, *Lév.*

560. SPHÆROPSIS UNDULATA, *B. & C.* **Stromate nigro suborbiculari undulato apicibus peritheciorum papilloso; sporis obovatis magnis hyalinis. (550, 554.)**

On dead bark of logs in fields. July. Looks like a dark *Hypocrea*. Spores ·00013 inch long.

561. S. PLACENTA, *B. & C.* **Stromate placentiformi undulato papilloso; sporis obovatis hyalinis sporophoris æquilongis. (343.)**

On bark of Orange-trees. More regular than the last in form, and smaller. Spores only half the length, ·0006 inch.

562. S. CLAVULIGERA, *B. & C.* **Peritheciis subcuticularibus depressis; sporis oblongo-clavatis hyalinis, sporophoris brevibus. (792.)**

Apparently on a Congo-bean. Spores ·0006–·00057 inch long. A nearly allied species occurs in Venezuela, with longer sporophores and crowded perithecia, growing on exposed wood.

563. S. IRREGULARIS, *B. & C.* **Peritheciis epidermide tectis convexis; sporis irregularibus subglobosis vel subclavatis hyalinis. (789.)**

On slender stems of some herbaceous plant. Spores ·0003 inch long, and about ·0002 wide.

564. S. AURANTIÆCOLA, *B. & C.* **Peritheciis gregariis in maculas pallidas sitis erumpentibus; sporis clavatis hyalinis. (547.)**

On dead Orange-leaves. May. Spores ·00028 inch long.

565. S. LUCIDA, *B. & C.* **Peritheciis lucidis gregariis ad marginem macularum circinantibus; sporis oblongis utrinque leviter attenuatis obtusiusculis hyalinis. (402.)**

On the upperside of dead leaves, forming distinct patches.

Perithecia bright and shining, convex, crowded round the irregular margin of the patches; spores and sporophores ·0005 inch long.

566. S. ERUMPENS, *B. & C.* Peritheciis paucis in stromate parvo orbiculari congestis rima dehiscentibus; sporis oblongis utrinque leviter attenuatis obtusiusculis hyalinis. (405.)

On the upper surface of dead leaves. From six to ten or even more erumpent perithecia are collected in little immarginate patches. Spores of the same shape as in the last, but twice as long and three times as broad, ·001 inch long, ·000285 wide in in the centre.

EPHELIS, *Fr.*

567. EPHELIS MEXICANA, *Fr. Fung. Mex.* (729.)

On the inflorescence of grasses, which it changes into a black solid mass, somewhat after the fashion of *Dilophosporium*. *Hab.* Mexico. Hymenium exposed, bearing slender thread-like spores, ·001 inch long, on delicate sporophores. The fungus resembles a *Peziza* on a black solid stroma.

SEPTORIA, *Fr.*

568. SEPTORIA OLIVACEA, *B. & C.* Sporis elongatis curvatis utrinque obtusis bi- triseptatis. (481.)

On the underside of leaves.

DINEMASPORIUM, *Lév.*

569. DINEMASPORIUM GRAMINEUM, *Lév. Ann. d. Sc. Nat.* May, 1846, p. 274. (418, 642.)

On dead stems of large grasses. July. *Hab.* Car. Sup., Europe. In the Cuban specimens the spores, with the appendages, measure ·0012 inch in length, the spore itself being a third of that length, ·0004; in the South-Carolinan specimens the appendages are much shorter, and the spores measure ·0008–·0006 inch.

EXCIPULA, *Fr.*

570. EXCIPULA STRIGOSA, *Fr. Syst.* ii. p. 103. (468, 527.)

On dead leaves of grasses. *Hab.* Swan River, Europe.

TORULACEI.

TORULA, *P.*

571. TORULA PALMICOLA, *B. & C.* Late effusa, floccis teneris brevibus, articulis ellipticis, e mycelio repente oriundis. (564.)

On leaves of Prickly Palm. February. Spores ·0006 inch long.

572. T. ORTHOCLADA, *Mont. Cub.* p. 296.
On dead herbaceous stems.

573. T. HERBARUM, *Lk. Obs.* i. 19. (441.)
On dead stems of Congo Bean. *Hab.* Europe, Algeria.

BACTRIDIUM, *Kze.*

574. BACTRIDIUM FULVELLUM, *B.* **Pallidum, laxum; sporis longissimis. (464.)**
On dead wood. *Hab.* Venezuela. Spores ·008–·016 inch long, 6–10-septate.

SEPTONEMA, *Cd.*

575. SEPTONEMA SOLIDUM, *B. & C.* **Nigerrimum, effusum, fragilissimum, floccis transversim longitudinaliterque septatis hic illic contractis. (782.)**
On petioles of Palm-leaves. December. Flocci so opake that the structure is not always visible, occasionally forked; divisions oblong, with four or five horizontal, and a few vertical, septa.

576. S. BREVIARTICULATUM, *B. & C.* **Stratum tenue, articulis brevibus doliiformibus septo transverso et verticali divisis. (442.)**
On dead stems of Congo Bean. Divisions ·001 inch long, with a single transverse and vertical septum, the internal membrane often protruding at either end when the divisions are separated.

577. S. CURTUM, *B. & C.* **Stratum punctiforme, floccis pulvinatis torulosis, articulis tumidulis constrictis demum cruciato-divisis.**
On petioles of Congo Bean. Articulations ·001 inch long.

SPORIDESMIUM, *Lk.*

578. SPORIDESMIUM MACULANS, *B. & C.* **Soris brevibus linearibus e macula alba elongata oriundis; sporis subglobosis e cellulis paucis constructis. (776.)**
On dead wood. Spores ·0004 inch long.

579. S. GLOBIFERUM, *B. & C.* **Soris orbicularibus nigris, mycelio ramoso; sporis globosis e cellulis plurimis constructis. (566.)**
On rotten logs in woods. February. Habit of *Calicium inquinans*. Flocci of mycelium articulated; spores ·002 inch in diameter.

580. S. ATROPURPUREUM, *B. & C.* **Effusum; sporis orbicularibus e**

cellulis magnis sæpe quaternatis constructis flocco brevi laterali suffultis, pluribus sæpe confluentibus. (761.)

On dead wood. Spores ·002 inch in diameter. Resembling in habit *S. aurantiacum*, B. & C.

581. S. MILLEGRANA, *B. & C.* Minutum, sparsum, punctiforme; sporis irregulariter subrotundis multicellulosis nigris e floccis parcis pallidioribus oriundis. (531.)

On dead leaves of *Clusia parasitica*. October. Spores ·004–·003 inch in diameter.

582. S. TESSARTHRUM, *B. & C.* Floccis erectis gracilibus apice sporam subquadratam e cellulis quatuor constructam gerentibus; cellulis primum lævibus, demum fortiter echinulatis. (461, 467.)

On dead Indian-Corn stems. *Hab.* Car. Inf., No. 3035. Spores ·001 inch broad. Forming thin olivaceous patches of various sizes.

TETRAPLOA, *B. & Br.*

583. TETRAPLOA ARISTATA, *B. & Br. Ann. of Nat. Hist.* ser. 2. v. p. 459. (421.)

On dead herbaceous stems with *Helminthosporium polymorphum*. *Hab.* Europe. Spores with only three awns. In other respects exactly like British specimens.

GYMNOSPORIUM, *Cd.*

584. GYMNOSPORIUM FULVUM, *B. & C.* Effusum, tenue, sporis obovatis peroxydatis stratum pallidius membranaceum insidentibus. (494.)

On dead twigs. *Hab.* Alabama No. 5224. On *Peziza psammophila*, B. & C., Car. Inf., on dead wood. Resembles *Oidium fulvum*. Spores ·001 inch long, shortly pedicellate.

585. G. CROCEUM, *B. & C.*—Mucor croceus, *Mont.* ! *Cub.* p. 307. Effusum, tenue; sporis obovatis globosisque lævibus croceis stratum pallidius insidentibus e floccis brevibus ramosis oriundis, nucleo magno.

On dead wood. Certainly not a *Mucor*, but closely allied to the last, though the abundant mycelium, large nucleus, and difference of colour show that it is distinct. Spores ·00057 inch long.

586. G. VINOSUM, *B. & C.* Soris minutis linearibus cuticula tectis; sporis obovatis utrinque obtusissimis. (451.)

On dead leaves of *Saccharum*. Spores ·001 inch long.

587. G. DECIPIENS, *B. & C.* Effusum, epidermide tectum, nigrum;

sporis obovatis brevissime pedicellatis (791 with *Diplodia vulgaris* and *Fusarium pallidum*).

On dead stems of Congo Bean. Habit like that of *G. Arundinis*, Cd. Spores ·00057 inch long, ·0005 wide.

PUCCINIÆI.

PUCCINIA, *P.*

588. **PUCCINIA INCARCERATA, *Lév. Ann. d. Sc. Nat.* Jan. 1845, p. 69. —Spondylanthe aphylla, *Presl, Rel. Hænk.* t. 53. (584.)**

On the inflorescence of some species of *Cissus*. *Hab.* Hispaniola, Guiana.

589. **P. PLAGIOPUS, *Mont.*! *Cub.* p. 294, tab. xi. f. 1.**

On the underside of the coriaceous leaves of some unknown plant.

590. **P. OBLIQUA, *B. & C.* Soris sine ordine sparsis hemisphæricis brunneis; sporis obovatis obtusissimis e pedicello laterali obliquo oriundis pallidissimis. (281.)**

On the leaves of some plant resembling Chickweed. Spores covered for a long time with the cuticle, which reflects prismatic colours, like some *Physarum*.

591. **P. HETEROSPORA, *B. & C.* Soris minutis in glomerulos orbiculares congestis brunneis; sporis subglobosis, pedicello deorsum attenuato subæqualibus, demum biseptatis. (283.)**

On the leaves apparently of some malvaceous plant.

592. **P. CYNANCHI, *Schwein.*! (730.)**

On the leaves and stem of some Asclepiad. *Hab.* Surinam. Spores about equal in length to the stem, ·001 inch long, broadly obovate.

593. **P. ASTERIS, *Schwein.*! *Syn.* p. 296. (275.)**

On some unknown leaf. *Hab.* United States. Exactly according with authentic specimens from Schweinitz's herbarium. Spores much elongated.

594. **P. SOLIDA, *B. & C.* Soris circa unum majorem annulatis ferrugineis; sporis pallidissimis compactis elongatis utrinque attenuatis apice obtusiusculis. (276.)**

On leaves of Compositæ. Spores very pale, closely packed.

595. **P. GRAMINIS, *P. Syn.* p. 528; *Mont. Cub.* p. 294.**

On grasses. *Hab.* New Zealand, United States, La Plata, Europe.

596. P. DEFORMATA, *B. & C.* Soris gregariis demum confluentibus; sporis ellipticis oblongisque obtusis, quandoque subapiculatis, e pedicello longo laterali obliquo oriundis. (284.)

On *Olyra latifolia*. January.

TRICHOBASIS, *Lév.*

597. TRICHOBASIS LABIATARUM, *Lév. D'Orb. Dict. Un.* v. 12. p. 785. (727.)

On leaves of Labiatæ. July. *Hab.* United States, Europe.

598. T. EUPHORBIÆCOLA, *B. & C.* Soris sparsis brunneolis epidermide demum rupta; sporis pallidis obovatis echinulatis. (720.)

On leaves of some *Euphorbia*. Spores ·005 inch long, paler than in *T. proeminens*, which, moreover, has smooth or nearly smooth spores.

UROMYCES, *Lév.*

599. UROMYCES APPENDICULATA, *Lév. l. c.* p. 786. (279.)

On leaves of Leguminosæ. *Hab.* California, United States, Europe.

600. U. GEMMATA, *B. & C.* Soris sparsis ferrugineis pulveraceis; sporis obovatis truncatis nodulosis, pedicello brevi pellucido. (278, 282.)

On the underside of leaves of *Convolvulus*, &c. Spores clothed with strong papillæform nodules ·0013 inch long. In the plant on *Convolvulus* the spores are less truncate.

CYSTOPUS, *Lév.*

601. CYSTOPUS CUBICUS, *Lév. Ann. d. Sc. Nat.* Dec. 1847, p. 376. (285.)

On leaves of *Convolvulus*. *Hab.* Port Louis, United States, Europe.

602. C. PULVERULENTUS, *B. & C.* Soris pulverulentis; sporis oblongis uno latere gemmatis. (285 in part.)

On leaves of Compositæ. Spores ·008–·001 inch long.

USTILAGO, *Lk.*

603. USTILAGO LEUCODERMA, *B. Ann. Nat. Hist.* March 1852, no. 54. (728.)

On sheaths of grasses. *Hab.* St. Domingo. Spores ovate, ·006 inch long.

604. U. AXICOLA, *B. l. c.* no. 55. (721.)

On fruit of *Fimbristylis*. August. *Hab.* St. Domingo, Alabama. Spores ·0005 inch long, subglobose. The Alabama plant is on *Cyperus*, and has the spores more oblong and slightly longer.

605. U. FLAVO-NIGRESCENS, *B. & C.* Subglobosa, solida, flavida; sporis globosis papillatis e flavidis aterrimis immixtis particulis minimis Brownianis. (288, 723.)

Occupying the rachis of the spikelets of *Scleria*. Spores ·00028 inch long.

ÆCIDIACEI.

ÆCIDIUM, *P.*

606. ÆCIDIUM RIVINÆ, *B. & C.* Crassum, deformans; margine peridiolorum subintegro; sporis obovatis echinulatis. (756.)

On racemes of *Rivina octandra*. May. Causing the matrix to swell after the manner of *Æ. sambuciatum*, Schwein. Spores ·0013 long, narrow below.

GRAPHIOLA, *Poit.*

607. GRAPHIOLA PHŒNICIS, *Poit. Ann. d. Sc. Nat.* iii. p. 472; *Mont. Cub.* p. 324.

On Palm-leaves. *Hab.* Bombay, Ceylon, Surinam, Texas, Europe.

HYPHOMYCETES.

ISARIACEI.

CERATIUM, *A. & S.*

608. CERATIUM HYDNOIDES, *A. & S. Consp.* p. 358. (501.)

On dead wood. *Hab.* Bombay, Ceylon, New England, Venezuela, Car. Inf., Europe.

609. C. AUREUM, *Lk. Obs.* ii. 39. (670.)

On dead wood. *Hab.* Europe.

STILBACEI.

STILBUM, *Tode.*

610. STILBUM BYSSISEDUM, *B. & C.* Stipite crasso tomentoso cinereo, basi bulboso; e strato cinereo tomentoso oriundo; capitulo globoso sordide lateritio; sporis minutis oblongis angustis. (426.)

On living branches of *Psidium*. *Hab.* San Carlos.

611. S. ATROFUSCUM, *Mont.*! Stipitibus crassis fasciculatis confluen-

tibus pruinosis nigris e strato cinereo tomentoso oriundis; capitulis globosis nigris. (491.)

On Lemon-trees. November. *Hab.* Guiana. This is not recorded in Montagne's Sylloge.

612. S. CLAVULATUM, *Mont.* ! *Sylloge*, p. 294. (497.)

On branches of trees. *Hab.* Surinam.

613. S. PELLUCIDUM, *Schrad. Journ.* 1799, p. 65. (504.)

On dead wood. *Hab.* Europe.

614. S. TOMENTOSUM, *Schrad. l. c.* tab. 3. fig. 1.

On decaying Myxogastres. *Hab.* Ceylon, Europe.

615. S. FIMETARIUM, *P. Myc. Eur.* i. p. 352. (737, 738.)

On dung, and on logs where the dung of some animal has rested. *Hab.* Europe, Car. Inf. Spores elliptic, 00025 inch long.

VOLUTELLA, *Tode.*

616. VOLUTELLA LONGIPILA, *B. & C.* Minuta, pallida, breviter stipitata, setis longis hyalinis cincta. (429.)

On stems of herbaceous plants. Habit like that of *V. ciliata*, Dittm.

617. V. SPHÆRIÆFORMIS, *B. & C.*—Periola sphæriæformis, *Mont. Cub.* p. 297.

On leaves of Monocotyledons. Dr. Montagne compares his plant with *Periola setosa*, Fr., which undoubtedly belongs to the genus *Volutella*, in which genus, therefore, we have placed the Cuban plant, of which we have seen no specimens.

FUSARIUM, *Lk.*

618. FUSARIUM TOMENTOSUM, *B. & C.* Sparsum, pallide flavum, exsiccatum albidum tomentosum; sporis oblongis. (785.)

On dead sticks. "Light yellowish." Not gelatinous, with the aspect of a *Peziza*. Spores oblong slightly contracted in the middle, ·0006–·0008 inch long.

619. F. SALMONICOLOR, *B. & C.* Pulvinatum, tuberculiforme, pallide lateritium, primum albo cinctum; sporis oblongis nec curvulis. (644.)

On dead twigs. Spores ·0005–·0004 inch long, sometimes a little attenuated at one extremity.

620. F. PALLIDUM, *B. & C.* Carneum, minutum, Pezizæforme; sporophoris delicatis; sporis ellipticis minutis. (796.)

On dead twigs, scarcely visible without a magnifier. It occurs

also mixed with *Diplodia vulgaris* and *Gymnosporium decipiens* (791). Spores ·0002 inch long.

621. F. PEZIZÆFORME, *B. & C.* Minutum, convexum, demum Pezizæforme, pallide coccineum; sporophoris subramosis; sporis oblongis angustis. (436.)

At the base of the stems of grasses. Spores ·00028 inch long.

622. F. HETEROSPORIUM, *Nees, Nov. Act.* ix. p. 135; *Fr. Syst.* iii. p. 472. (286.)

On the decaying seeds of some grass. *Hab.* Europe. Spores ·0013 inch long.

EPICOCCUM, *Lk.*

623. EPICOCCUM COMPACTUM, *B. & C.* Placentæforme, atropurpureum; stromate firmo; sporis globosis paucicellulosis. (582.)

On dead stems of some climbing plant.

DEMATIEI.

ARTHROBOTRYUM, *Cesati.*

624. ARTHROBOTRYUM MELANOPLACA, *B. & C.* Soris irregularibus separabilibus; stipite communi e fibris connatis oriundo, apicibus liberis sporiferis; sporis ellipticis uniseptatis fuscis utrinque appendiculatis, appendice superiore brevi, inferiore longa deorsum attenuata. (473, 562, 778, 781.)

On leaves of *Psychotria* &c. Spores ·002–·0013 long.

SPOROCYBE, *Fr.*

625. SPOROCYBE BYSSOIDES, *Fr. Syst.* iii. p. . (435, 445.)

On dead stems of Congo Bean. *Hab.* Car. Inf., Europe.

MONOTOSPORA, *Cd.*

626. MONOTOSPORA SPHÆROPHORA, *B. & C.* Stipite conico e cellulis elongatis compacto, apice sporam maximam gerente. (444.)

On dead stems of Congo Bean. Spores ·004 inch in diameter.

HELMINTHOSPORIUM, *P.*

627. HELMINTHOSPORIUM RAVENELII, *Curt.*! *MS.* Floccis flaccidis flexuosis; sporis magnis cymbiformibus 3–4-septatis fuscis, endochromatibus connexis. (724.)

In spongy masses on the inflorescence of some grass, apparently *Sporobolus indicus*. *Hab.* Car. Inf., No. 1339. Spores ·002–·002 inch long. Endochromes connected as in *Valsa profusa.*

628. H. CASSIÆCOLA, *B. & C.* Floccis fasciculatis basi conjunctis fuscis; sporis maximis ovato-lanceolatis elongatis multiseptatis, endochromatibus medio contractis. (774.)

On leaves of some *Cassia*. March. Spores ·006 inch long, siliquose; endochrome shaped like an hourglass.

629. H. VINOSUM, *B. & C.* Floccis erectis simplicibus furcatisve vinosis sursum nodosis, nodis fructiferis; sporis oblongis leviter clavatis triseptatis. (446.)

On dead stems of Congo Bean. Spores ·00095 inch long.

630. H. MOLLE, *B. & C.* Floccis fasciculatis rectis obtusis simplicibus flexuosis; sporis oblongis vel oblongo-ellipticis utrinque obtusis triseptatis. (443.)

On dead stems of Congo Bean. Spores ·001 inch long. *Hab.* Car. Inf., No. 1575, 2108. The South-Carolina specimens are on the Cow Pea (*Dolichos*) and *Passiflora*.

631. H. GRANULATUM, *B. & C.* Floccis brevibus hic inde furcatis vinosis; sporis magnis oblongis triseptatis granulatis. (795.)

On dead herbaceous stems. Spores ·002 inch long, or rather shorter, strongly granulated.

632. H. POLYMORPHUM, *B. & C.* Floccis simplicibus obtusis vinosis; sporis clavatis lateralibus sub-8-septatis; minoribus quandoque floccis agglutinatis. (421.)

On dead herbaceous stems. Spores very variable in length.

633. H. CORONATUM, *B. & C.* Floccis simplicibus apice tumidis, spiculiferis; sporis e spiculis oriundis ellipticis transversim longitudinaliterque septatis. (361.)

On dead stems of herbaceous plants. Spores ·001 inch long, by ·0004.

634. H. DORYCARPUM, *Mont. Cub.* p. 302.

On dead leaves.

ZYGOSPORIUM, *Mont.*

635. ZYGOSPORIUM OSCHEOIDES, *Mont.* ! *Cub.* p. 303. (558.)

On Palm-leaves.

DEMATIUM, *Fr.*

636. DEMATIUM GRAMINEUM, *Pers. Myc. Eur.* i. p. 16; *Mont. Cub.* p. 302.

On leaves of grass. *Hab.* Europe.

CLADOSPORIUM, *Lk.*

637. CLADOSPORIUM HERBARUM, *Lk. Obs.* ii. 37. (722.

On dead vegetables. *Hab.* Cosmopolitan.

638. C. SPONGIOSUM, *B. & C.* **Soris densis olivaceis; floccis flexuosis hic illic ramosis; sporis oblongis utrinque attenuatis triseptatis, apud commissuras contractis.** (287, 476 with Ergot.)

On fruit of *Cenchrus*, and on the inflorescence of *Setaria*. Habit of *Helminthosporium Ravenelii*, Curt. Spores ·001–·0013 inch long.

639. C. ANOMALUM, *B. & C.* **Soris suborbicularibus olivaceis; floccis erectis flexuosis nodulosis parcius apice furcatis; sporis oblongis 2–3-septatis pallidis breviter stipitatis.** (482.)

On the underside of leaves of Malvaceæ. Spores oblong, very slightly ovate at the base, sometimes flexuous, ·0015 inch long, stem extremely short.

640. C. OXYSPORUM, *B. & C.* **Soris pallidis olivaceis; floccis pallidis hic illic ramosis lævibus; sporis ex obovatis submetulæformibus.** (489.)

On dead leaves of *Passiflora*. Spores ·0006–·0008 inch long.

641. C. HYPOPHLŒUM, *B. & C.* **Maculis orbicularibus; floccis flexuosis implexis; sporis curvulis oblongis triseptatis.** (561.)

On leaves of *Sapindaceæ*. February.

MUCEDINES.

ASPERGILLUS, *Mich.*

642. ASPERGILLUS ERYTHROCEPHALUS, *B. & C.* **Floccis hyalinis rigidis e mycelio flavo oriundis; capitulo globoso lateritio; sporis late ellipticis.** (764.)

On fallen fruit. November. Spores ·0004 inch long, given off from the papillate head.

643. A. CANDIDUS, *Lk. Sp.* i. p. 65; *Mont. Cub.* p. 305.

On fallen leaves. *Hab.* United States, Europe.

BOTRYTIS, *Mich.*

644. BOTRYTIS TILLETII, *Desm. Ann. d. Sc. Nat.* 1838, x. 308. (725.)

On living herbaceous plants. *Hab.* Neilgherries, Car. Inf., Europe.

STACHYLIDIUM, *Lk.*

645. STACHYLIDIUM GREGARIUM, *B. & C.* **Pallide fuscum, constipatum; floccis repetite furcatis, supra ramosissimis, sporis subellipticis.** (669.)

On dead wood. Spores ·00025 inch long. Forming a dense reticulated mass, at first sight resembling a *Thelephora*.

PERONOSPORA, *Cd.*

646. PERONOSPORA CUBENSIS, *B. & C.* Candida; floccis sursum furcatis, ramulis ultimis rectis nec uncinatis, sporis metulæformibus vel oblongis obtusis. (412.)

On leaves of some cucurbitaceous plant. Spores about ·001 inch long.

COREMIUM, *Cd.*

647. COREMIUM COPROPHILUM, *B. & C.* Stipite solido candido lævi glabro; capitulo glauco; sporis minutis. (666.)

On the dung of some bird. April. Spores concatenated. This is certainly not a mere condition of some *Penicillium.*

OIDIUM, *Lk.*

648. OIDIUM MEGALOSPORUM, *B. & C.* Soris pulvinatis melleis, articulis ellipticis subglobosisque maximis lævibus. (431.)

On dead bark. *Hab.* Alabama, no. 6094. Spores with three distinct membranes, the intermediate ones with short cylindrical connecting processes ·002–·0028 inch long. Habit like that of *Bactridium.* The Alabama specimens are on some *Polyporus.*

TRICHODERMACEI.

PILACRE, *Fr.*

649. PILACRE FAGINEA, *B. & Br. Ann. Nat. Hist.* 1850, vol. v. p. 365. (741.)

On dead wood. *Hab.* Europe.

650. P. NIVEA, *B. & C.* Nivea, pedunculo cartilagineo glabro nitido subramoso; capitulo furfuraceo. (736.)

On dead bark.

PHYSOMYCETES.

MUCORINI.

ASCOPHORA, *Tode.*

651. ASCOPHORA FUSCA, *B. & C.* Cæspitosa, fusca, primitus alba; floccis articulatis; vesiculis globosis dein collapsis umbraculiformibus, sporis globosis. (472.)

On fruit of *Artocarpus.* Vesicles brilliant and sparkling, when dry, like little beads of glass; spores ·0004 inch in diameter.

ASCOMYCETES.

ELVELLACEI.

MORCHELLA, *Dill.*

652. **MORCHELLA ESCULENTA**, *P. Syn.* p. 618, δ. CONICA. (381, 656.)

On burnt soil. *Hab.* Kashmir, Australia, Tasmania, Mexico, United States, Europe.

GEOGLOSSUM, *P.*

653. **GEOGLOSSUM HIRSUTUM**, *P. Comm.* p. 37. (382.)

On the ground. *Hab.* Mauritius, Java, Bourbon, New Zealand, Louisiana, Car. Inf., Europe.

RHIZINA, *Fr.*

654. **RHIZINA SPONGIOSA**, *B. & C.* Magna, crassa; cupulis irregularibus, floccis cirrhatis implexis atro-fuscis vestitis; hymenio pallide fusco; sporidiis fusiformibus. (383, 638, 646.)

On bushes "growing vertically." January. Cups 1½ inch across; sporidia ·0024 inch long, ·0008 broad. A magnificent species.

PSILOPEZIA, *B.*

655. **PSILOPEZIA MIRABILIS**, *B. & C.* Irregularis, albida, e matrice demum separabilis, tenuis; margine demum elevato, paraphysibus ramis brevibus simplicibus obsitis; ascis clavatis hic illic proliferis; sporidiis lato-ellipticis. (224.)

On twigs, looking at first like a *Corticium*. The paraphyses, which seem here to be abortive asci, are sometimes narrow, with short pinnæ—sometimes cylindrical with processes all round, and gradually passing into asci, some of which when containing sporidia have short processes.

PEZIZA, *Dill.*

656. **PEZIZA (DISCINA) DOCHMIA**, *B. & C.* Stipite crassiusculo obtuso sursum dilatato; hymenio fusco obliquo; subtus pallida; sporidiis cymbiformibus lævibus. (662.)

Probably on rotten wood. November 24. Sporidia ·001 inch long, ·0005 broad.

657. **P. (DISCINA) PALMICOLA**, *B. & C.* Sessilis, expansa, subtus

albida; hymenio pallide flavo-fusco; sporidiis late ellipticis lævibus. (300.)

On rotten Palms. February. Cup 2 inches across; sporidia ·0006–·0005 inch long, ·0004 wide. Differs from *P. repanda* in the much smaller and proportionally wider sporidia.

658. P. (DISCINA) ADNATA, *B. & C.* **Arcte adnata, applanata, margine angusto erecto; hymenio atro-fusco; sporidiis ellipticis irroratis** (212.)

On rotten logs in dense Palm-woods. March. 1 inch across; sporidia ·001 inch long, ·0005 wide, granulated with little bead-like globules. Approaches near to *Psilopezia*, only the margin is quite distinct.

659. P. (DISCINA) REPANDA, *Wahl. Ups.* p. 466. (215.)

Probably on rotten wood. *Hab.* Europe. Sporidia ·001 inch long, ·0005 broad. In European specimens the sporidia are ·00083 inch long.

660. P. (DISCINA) INÆQUALIS, *B. & C.* **Magna, subelliptica, subtus alba, adpresso-tomentosa, centro affixa; hymenio aurantiaco; sporidiis cymbæformibus lævibus.** (187.)

Probably on rotten wood. Cup 3 inches across; sporidia ·001 inch long, ·0005 broad. Resembling *P. aurantia*, but with very different sporidia.

661. P. (DISCINA) HIRNEOLOIDES, *B.* **Sessilis vel brevissime stipitata, rubra, subtus alba; hymenio lævissimo; sporidiis cymbæformibus quandoque leviter curvatis.** (236, 659.)

On rotten wood. *Hab.* Clarence River, Australia. Cups 1–1½ inch across; sporidia ·0009–·001 inch long, ·0004–·0005 broad. Asci cylindrical, very slender below. The species looks at first sight very much like an *Hirneola*, the hymenium is so smooth.

662. P. (GEOPYXIS) DOMINGENSIS, *B. Ann. Nat. Hist.* March, 1852, no. 57. (660, 661, 716.)

On dead wood. *Hab.* St. Domingo. One inch or more across; sporidia ·0009–·001 inch long, ·0004–·0005 broad.

663. P. (GEOPYXIS) LOBATA, *B. & C.* **Cupulis planis undulato-lobatis, hymenio rufo hic illic cribroso, subtus pallidioribus; sporidiis globosis irroratis.** (652.)

On the ground. Cups ⅓–½ inch across; sporidia ·0005 inch in diameter.

664. P. (GEOPYXIS) HINDSII, *B. Hook. Lond. Journ.* 1842, i. p. 456. (346, 657.)

On dead wood. July. *Hab.* New Ireland, St. Domingo. Bright orange above, pale below.

665. P. (GEOPYXIS) TRICHOLOMA, *Mont.! Ann. d. Sc. Nat.* 1834, ii. p. 77. (347, 350, 658.)

On dead wood. *Hab.* Ceylon, Vera Cruz, St. Domingo. Some of Dr. Montagne's specimens belong to *P. Hindsii.*

666. P. (GEOPYXIS) SUBGRANULATA, *B. & C.* Applanata, lutea, margine setis pallidis obsito; sporidiis granulatis. (370.)

On dung. Resembling *P. granulata*, Bull.; but in that the sporidia are smooth and ·0006 inch long, in this granulated and ·001 inch long.

667. P. (HUMARIA) SCATIGENA, *B. & C.* Hemisphærica, atro-vinosa, recens subviridis, extus farinosa alba, margine inflexo; ascis ellipticis; sporidiis biseriatis ellipticis lævibus. (636.)

On dung. October. Sporidia ·0008–·0009 inch long, ·0004 wide.

668. P. (HUMARIA) BELLA, *B. & C.* Aurantiaca, subplana, leviter marginata; sporidiis ellipticis lævibus utrinque leviter angustatis. (650.)

On rotten wood. February. One third of an inch across; sporidia ·0009 inch long, ·0007 wide.

669. P. (HUMARIA) GLOBIFERA, *B. & C.* Lutea; cupulis crateriformibus; margine inflexo quandoque lobato; ascis clavatis vel cylindricis; sporidiis globosis lævibus. (363, 282, 645.)

On the ground. Nearly allied to *P. sphæroplea*, B. & C., Car. Inf., nos. 1991, 2974, which is more deeply coloured and has on the whole larger fruit. The asci vary in form, being much broader in 363, than in 282, and biseriate instead of uniseriate. In the former they are ·00037 inch in diameter, in the latter scarcely reaching ·0005. *Peziza miltina*, a closely allied species from New Zealand, has sporidia ·0006 inch in diameter.

670. P. (HUMARIA) QUISQUILIARUM, *B. & C.* Lutea, crateriformis, sessilis, margine inflexo; ascis lineari-clavatis; sporidiis fusiformibus curvatis 3–4 septatis. (366.)

On dead twigs &c. Sporidia ·001–·0013 inch long.

671. P. (SARCOSCYPHÆ) HIRTA, *Schum. Fl. Sæll.* ii. p. 422. (242, 376, 377, 378, 379, 630, 635, 649, 651.)

On dead wood, earth, and stones. November, December. February. *Hab.* Ceylon, Europe. The sporidia vary from ·001 to ·0007 in length, and from ·0005–·0004 in width. In every case they are granulated.

672. P. (SARCOSCYPHÆ) CUBENSIS, *B. & C.* Cupula concava coc-

cinea setis badiis cincta; sporidiis late ellipticis minoribus granulatis. (380.)

On logs. Sporidia ·00057 inch long, smaller and much broader in proportion than in any state of *P. hirta*.

673. P. (Sarcoscyphæ) monilifera, *B. & C.* Minuta, terrestris, lutea; hymenio primum umbilicato demum flexuoso immarginato; ascis linearibus; sporidiis uniseriatis globosis lævibus. (375.)

On the ground. Scarcely half a line across; sporidia ·0006 inch in diameter.

674. P. (Sarcoscyphæ) melanopus, *B. & C.* Minuta, subhemisphærica, extus alba, farinaceo-tomentosa; hymenio luteo; stipite brevi nigro. (368.)

On wood amongst *Jungermanniæ*. About 1 line in diameter.

675. P. (Sarcoscyphæ) crispata, *B. & C.* Irregularis, lobata, crispata, plus minus adnata, subtus concolor tomentosa; hymenio rufo; sporidiis cymbiformibus. (348.)

On very rotten wood, spreading for some distance like a *Psilopezia*. Sporidia ·001 inch long.

676. P. (Sarcoscyphæ) albo-tecta, *B. & C.* Carnea, ubique, farinaceo-tomentosa; cupulis centro affixis subtus rugosis; hymenio demum plano; sporidiis clavatis lævibus biseriatis. (626.)

On earth in savannahs. Sporidia ·0006 inch long, ·0002 wide, sometimes much less. Looks at first sight like a Lichen; margin sometimes crenate, at length quite obliterated. Not exceeding a line in diameter.

677. P. (Sarcoscyphæ) stictica, *B. & C.* Cupulis subhemisphæricis; hymenio aurantiaco-rubro concavo setis badiis cincto; sporidiis late ellipticis punctis minutis exasperatis. (643.)

On the ground by the side of paths. June. Sporidia ·0008 inch long by ·0006 broad, minutely dimpled like the head of a thimble.

678. P. (Sarcoscyphæ) melastoma, *Sow.* t. 149.—Peziza rhizopus, *A. & S.* p. 317. (384, 637.)

On Palm-leaves. December. *Hab.* Europe. Sporidia slightly narrowed at either end, ·001 inch long, ·0004 wide.

679. P. (Dasyscyphæ) caulicola, *Fr. Syst.* ii. p. 94. (648.)

On Palm-leaves. *Hab.* Car. Inf., Europe.

680. P. (Dasyscyphæ) corticalis, *P. Obs.* i. p. 28. (357, 365, 653.)

On bark. *Hab.* Europe.

681. P. (Dasyscyphæ) fimbriifera, *B. & C.* Nivea; stipite brevi

decolorante pruinoso; cupulis extus farinoso-tomentosis marginem versus floccis longis rectis ornatis. (654.)

On stems of Ferns. December. Minute.

682. P. (DASYSCYPHÆ) ILLOTA, *B. & C.* Stipite brevi solido; cupula crateriformi tomentosa cervina; hymenio rufo. (633.)

On bark. About ½ an inch across.

683. P. (DASYSCYPHÆ) RAPHIDOPERA, *B & C.* Primum globosa, breviter albo-floccosa, plus minus furfuracea, demum expansa, margine rotundato inflexo; ascis elongatis; sporidiis linearibus utrinque acutis. (364.)

On rotten wood. *Hab.* Venezuela. About a line across. Sporidia variable in length, from ·001 inch and upwards; endochrome often retracted to either end.

684. P. (DASYSCYPHÆ) INSPERSA, *B. & C.* Cupula subglobosa extus stipiteque brevi crassiusculo dense albo-farinaceis; hymenio carneo. (354.)

On dead wood. Minute, gregarious.

685. P. (DASYSCYPHÆ) VARIECOLOR, *Fr. Syst.* ii. p. 100. (360.)

On bark. *Hab.* Car. Inf., Europe.

686. P. (DASYSCYPHÆ) HYALINA, *P. Syn.* p. 655. (367.)

On dead wood. *Hab.* Tasmania, Car. Inf., Europe.

687. P. (DASYSCYPHÆ) VILLOSA, *P. Syn.* p. 655. (351.)

On dead stems of herbaceous plants. *Hab.* Car. Inf., Europe.

688. P. (TAPESIA) ANOMALA, *P. Obs.* 2. p. 29; *Mont.*! *Cub.* p. 361. (349.)

On dead bark and wood. *Hab.* Tasmania, Sumatra, United States, Europe.

689. P. (TAPESIA) LEUCORHODINA, *Mont.*! *Cub.* p. 360, tab. 13. fig. 4.

On living leaves.

690. P. (FIBRINA) CHLORASCENS, *Schwein.*! *Syn.* p. 175. (358.)

On bark. *Hab.* United States. Cup very shortly stipitate, crateriform, externally pallid green, striato-tomentose, margin inflexed; hymenium yellow; asci clavate; sporidia fusiform, ·0006–·0005 inch long.

691. P. (HYMENOSCYPHÆ) LEUCOPSIS, *B. & C.* Carneo-pallida, irregularis, margine primum erecto demum reflexo; ascis linearibus; sporidiis allantoideis. (372).

On dead wood. Cup ⅛–¼ inch across; sporidia ·0002 inch long.

692. P. (Hymenoscyphæ) viridi-atra, *B. & C.* **Sessilis, atroviridis, subtus granulata, undulata irregularis; sporidiis ellipticis demum subfuscis.** (369.)

On dead wood with some *Polyporus*. Cup $\frac{1}{3}$ inch across: sporidia ·0002 inch long. Not staining the wood.

693. P. (Mollisia) vinosa, *A. & S. Consp.* p. 308. (371, 628, 631.)

On dead wood. December. *Hab.* Car. Inf., Europe.

694. P. (Mollisia) vulgaris, *Fr. Syst.* ii. p. 146. (355, 640.)

On dead wood. July. *Hab.* Veraquaz, Car. Inf., Europe.

695. P. (Mollisia) sclerogena, *B. & C.* **Sessilis, subhemisphærica, lutea, margine inflexo, demum applanata; ascis clavatis; sporidiis biserialibus fusiformibus curvulis triseptatis.** (754.)

On Palm-petioles. Sporidia ·00125 inch long.

696. P. (Mollisia) hypophylla, *B. & C.* **Hypophylla, stipite brevissimo, extus rufa; hymenio livido pallide corneo; cupula crateriformi marginata sinuata; sporidiis filiformibus.** (762.)

On the underside of some leaf amongst the brown velvety down.

697. P. (Patellea) pudica, *B. & C.* **Minima, applanata, marginata; hymenio luteolo, margine nigro; ascis lanceolatis uniseptatis.** (749.)

On Fern. Sporidia ·00028 inch long.

Helotium, *Fr.*

698. Helotium (Pelastea) miserum, *B. & C.* **Minutum, albidum, claviforme; stipite brevi; hymenio subgloboso; ascis clavatis; sporidiis subclavatis, endochromate demum quadripartito.** (456.)

On bark amongst moss. Sporidia ·0005 inch long.

699. H. (Pelastea) æruginosum, *Fr. Summ.*—**Peziza æruginosa, *Fl. Dan.* tab. 1260. fig. 1.** (625.)

On bark. *Hab.* Australia, Car. Inf., Europe.

700. H. (Calycella) rhytidodes, *B. & C.* **Sessile, stramineum; cupula crateriformi subtus rugoso-plicata; sporidiis ellipticis lævibus.** (373.)

701. H. (Calycella) crocinum, *B. & C.* **Crocatum, obconicum; stipite brevi crasso; cupula crateriformi, margine inflexo.** (374.)

On dead twigs. Very like *Peziza crocata*, Mont., but that has a long stem and is at first globose.

702. H. (Calycella) nigripes, *Fr. Summ.*—**Peziza nigripes, *Fr. Syst.* ii. p. 132.** (634.)

On dead wood. August. *Hab.* Tasmania, Europe. Sporidia

·0002 inch long, ·00005 wide. The Cuba plant belongs to a white variety.

SPHINCTRINA, *Fr.*

703. SPHICTRINA CUBENSIS, *B. & C.* **Cupulis hemisphæricis extus stipiteque brevi rufis; hymenio demum plano nigro pruinoso, margine primum arcte inflexo.** (525.)

On an imperfect *Xylaria*. Sporidia ·00025 inch long, oblong.

MIDOTIS, *Fr.*

704. MIDOTIS HETEROMERA, *Mont.*! *Syll.* p. 189. (580.)

On dead wood. *Hab.* Guiana, St. Domingo. Sporidia cymbiform, ·0004 inch long, ·00014 wide, hyaline.

705. M. VERRUCULOSA, *B. & C.* **Cupula obliqua extus lateritia verrucosa; hymenio livido-fusco.** (663.)

On dead wood. Differs from the last in its verrucose, not simply mealy surface, and broader rather shorter sporidia, ·0004 inch long, ·0002 inch wide.

CORDIERITES, *Mont.*

706. CORDIERITES CORALLOIDES, *B. & C.* **Fragilis, fusca, cæspitosa; stipite communi furcato, ramis rectis elongatis; cupulis crateriformibus subfastigiatis; hymenio fusco, margine inflexo; ascis linearibus, sporidiis ellipticis.** (326.)

Apparently on *Hypoxylon*.

ASCOBOLUS, *P.*

707. ASCOBOLUS CUBENSIS, *B. & C.* **Parvus, crateriformis, viridiflavus; ascis linearibus; sporidiis ellipticis pallide fuscis, longitudinaliter rugoso-plicatis.** (627.)

On hogs' dung. December. Sporidia ·0004 inch long, ·0002 broad.

BULGARIA, *Fr.*

708. BULGARIA SIMILIS, *B. & C.* **Cupula convexa purpurea extus pallidiore; ascis clavatis; sporidiis biseriatis oblongis; paraphysibus furcatis.** (189.)

On dead wood. Sporidia ·0004 inch long, ·0002 wide. Differing chiefly from *B. sarcoides* in the much smaller sporidia. In that species they are a third longer, and have the endochrome distinctly retracted at either end. *B. sarcoides* occurs in the United States with the same fructification as in European specimens.

Stictis, *P.*

709. Stictis (Eustictis) pupula, *Fr. Syst.* ii. p. 193. (385.)
On dead twigs. *Hab.* Car. Inf., Europe.

710. S. (Eustictis) Thelotrema, *Mont. Cub.* p. 356.
On bark.

711. S. (Propolis) macularis, *B. & C.* Subelliptica, elongata, e macula pallida oriunda, epidermide marginata; disco pallido; ascis cylindricis; sporidiis flocciformibus. (748.)
On leaves of *Cyperus*. July.

712. S. (Propolis) foliicola, *B. & C.* Suborbicularis, pallida; epidermide stellatim rupta cincta; disco plano; sporidiis linearibus. (488.)
On dead leaves of *Clusia*. Sporidia not flocciform as in the last.

PHACIDIACEI.

Phacidium, *Fr.*

713. Phacidium pluridens, *B. & C.* E macula lata pallida illimitata oriundum; perithecio pluridentato suborbiculari. (533.)
On dead leaves of *Clusia parasitica*. October. Sporidia flocciform.

714. P. limitatum, *B. & C.* E macula pallida linea nigra limitata oriundum; peritheciis triangularibus quadratisve ore 3–4-dentato. (422.)
On dead coriaceous leaves, probably of some *Clusia*, accompanied by *Hysterium*. Sporidia flocciform. Resembling *P. delta*, Kze., but having none of the lustre of that species, which occurs on *Lauraceæ* in Madeira.

715. P. Tetraceræ, *Rud. in Linn.* iv. p. 118; *Mont. Cub.* p. 359.
On leaves of *Tetracera volubilis*, Pœppig.

Rhytisma, *Fr.*

716. Rhytisma atramentarium, *B. & C.* Superficiale; stromate tenui maculari irregulari sæpe subannulato, pustulis brevibus irregularibus granuliformibus. (565, 608.)
On the underside of leaves. Looks like ink-spots, rough with a few flattish irregular pustules when seen under a lens.

717. R. gyrosum, *Mont. Cub.* p. 357.
On the upper surface of coriaceous leaves.

718. R. maculans, *Mont*! *Cub.* p. 357.
On coriaceous leaves.

719. R. CONCENTRICUM, *B. & C.* Stromate suborbiculari atramentario tenero, pustulis concentrice dispositis rugoso. (567.)

On bark in woods. February. Patches 1–2 lines across.

720. R. MICRASPIS, *B. & C.* Stromate orbiculari tenui convexulo atro ruguloso apice rimis brevibus aperto. (477, 779.)

On leaves of *Rubiaceæ*. May. About one line across.

721. R. LEPTOSPILUM, *B. & C.* Stromate tenui orbiculari atro-fusco medio hic illic demum rimoso; ascis clavatis; sporidiis ellipticis obtusis uniseptatis demum medio contractis. (537.)

On leaves of *Lauraceæ*. May. Sporidia diplodioid; spots not one line broad.

722. R. RUFULUM, *B. & C.* Tenue, orbiculare, atro-rufum, rimis minutis radiantibus rugosum. (401, 770.)

On the upper surface of leaves. Resembling at first sight some *Micropeltis*. Unfortunately there is no fruit.

HYSTERIUM, *Tode.*

723. HYSTERIUM FOLIICOLUM, *Fr. Syst.* ii. p. 592. (621.)

On dead leaves. *Hab.* Chili, Madeira, Car. Inf., Europe.

724. H. CLUSIÆ, *B. & C.* Immersum, epidermide crassa elevata arcte cinctum, lineare, curvatum trigonumque; sporidiis ellipticis uniseptatis, apud commissuram contractis. (535.)

On dead leaves of *Clusia parasitica*. October. Sporidia ·0005 inch long, ·0002 broad. Much smaller than the following species.

725. H. PLATYPLACUM, *B. & C.* Macula lata, pallida; perithecio flexuoso epidermide elevata arcte cincto; disco aperto fusco; ascis linearibus; sporidiis flocciformibus. (423, 424.)

On dead leaves of *Clusia*.

OSTROPA, *Fr.*

726. OSTROPA ALBO-CINCTA, *B. & C.* Peritheciis cylindricis subconnatis gregariis, apice obtusissimis, rima pulvere niveo cincta. (345.)

On dead bark. Densely gregarious, subconnate, clothed at the base with a few indistinct flocci. Sporidia elongated, subcymbiform, ·0006 inch long, ·00016 broad. An extremely beautiful species.

ANGELINA, *Mont.*

727. ANGELINA LEPRIEURII, *Mont.*! *Syll.* p. 188. (619.)

On bark. *Hab.* Guiana. Sporidia ·0016 inch long, ·0004

wide, triseptate. The sporidia in *Angelina conglomerata* are totally different, being narrow and uniseptate, ·0004–·0003 inch long, ·000083 wide.

728. A. NIGRO-CINNABARINA, *B. & C.*—Patellaria nigro-cinnabarina, *Schwein.*—Hysterium rufulum, *Mont. Cub.* p. 359. (386, 387, 618, 622, 623.)

On dead twigs of Orange and Coffee. February, August. *Hab.* New Zealand, Surinam, Car. Inf., N. Africa, Europe. Sometimes staining the wood of a lilac tinge. Sporidia ·001 inch or more long, oblong triseptate.

AILOGRAPHUM, *Lib.*

729. AILOGRAPHUM MACULARE, *Berk. & Br. Ann. Nat. Hist.* June 1861, p. 451, tab. 16. fig. 21. (615.)

On dead leaves of *Bromeliaceæ*. December. *Hab.* Europe.

730. A. CILIATUM, *B. & C.* Peritheciis rectis nitidis basi breviter ciliatis; stromate nullo vel obsoleto. (611, 612.)

On dead leaves of *Clusia* with *Asterina reptans*.

ASTERINA, *Lév.*

731. ASTERINA PELLICULOSA, *B. Bot. Ant. Voy. Crypt.* p. 147.—A. Lepiniana, *Mont.* (769.)

On leaves of various plants as *Guazuma*. March. *Hab.* Chonos Archipelago, Ceylon, Nicaragua, Tahiti. Sporidia oblong, ·0005 inch long, uniseptate.

732. A. PLATASCA, *B. & C.* Stromate tenui nigro; peritheciis confluentibus; ascis globosis; sporidiis magnis oblongis uniseptatis apud commissuram contractis. (559.)

On leaves of *Passiflora* and other plants. February. Sporidia ·001 inch long, ·0004 wide, at length brown.

733. A. MEGALOSPORA, *B. & C. U. S. E. E.* (388, 394.)

On dead leaves of *Passiflora* and other plants. *Hab.* Bonin Isles. Stroma thin and inconspicuous, consisting of creeping threads; perithecia distinct, punctiform, at length splitting in a stellate manner; edge slightly floccose; threads obtuse, sometimes furcate; asci globose; sporidia like those of a *Diplodia*, ·001–·0006 inch long, at length brown, four in each ascus.

734. A. REPTANS, *B. & C.* Stromate tenui subreticulato, peritheciis minutis e cellulis radiantibus constructis obsito; ascis clavatis; sporidiis oblongis subfusiformibus uniseptatis. (409, 611, 612.)

On leaves of *Piper*. Habit of a young epiphyllous *Collema*

Some of the perithecia contain minute allantoid spermatia. The specimens are young; so that the sporidia will not come out of the asci, and therefore cannot be measured accurately.

735. A. PICEA, *B. & C.* Peritheciis seminiformibus nigris in stromate parco orbiculari sitis; ascis clavatis; sporidiis biserialibus oblongis angustis uniseptatis. (411.)

On the upper surface of leaves. Sporidia ·0005–·0004 inch long, ·00015 wide.

736. A. BULLATA, *B. & C.* Stromate orbiculari tenuissimo; peritheciis margine laciniatis radiato-cellulosis; ascis cylindricis; sporidiis biseriatis oblongis subfusiformibus uniseptatis. (750.)

On leaves of *Peperomia*, seated on brown spots of diseased tissue. Sporidia ·0006 inch long, ·0001 broad.

737. A. EXAMINANS, *B. & C.* Peritheciis minutissimis in soros nigros præcipue nervicolas congregatis, floccis brevibus bifidis apicibus obtusis cinctis; ascis brevibus clavatis; sporidiis ellipticis uniseptatis minoribus. (788.)

On leaves. Stroma obsolete.

738. A. SOLANICOLA, *B. & C.* Stromate floccis repentibus; peritheciis globosis marginem versus e cellulis angustis flexuosis compactis; ascis lanceolatis; sporidiis biseriatis oblongis subfusiformibus hyalinis. (560.)

On leaves of *Solanum*. February.

739. A. CONNATA, *B. & C.* Peritheciis minutissimis cellulosis nec radiato-cellulosis, in soros minutos confluentibus, floccis brevibus parcissimis cinctis; sporidiis minutis oblongis uniseptatis. (487.)

On leaves of *Clusia*. The specks at first sight seem simple, but under a higher magnifier they are composed of many confluent perithecia: sporidia ·0002 inch long, ·000074 wide, brown.

MICROTHYRIUM, *Mont.*

740. MICOTHYRIUM CUBENSE, *B. & C.* Peritheciis planis suborbicularibus sparsis hic illic confluentibus atro-fuscis; ascis brevibus late clavatis; sporidiis biseriatis ovatis hyalinis. (440.)

On Congo bean. Sporidia ·0005 inch long, ·00025 wide.

741. M. ALBIGENA, *B. & C.* Peritheciis minutissimis radiato-cellulosis, e strato candido oriundis. (750.)

On leaves of *Peperomia*. May. Growing on the white margin of brown spots of diseased tissue.

MICROPELTIS, *Mont.*

742. MICROPELTIS APPLANATA, *Mont.*! *Cub.* p. 325, tab. 12. f. 6. (410, 530, 546, 556, in part.)

On leaves of trees and ferns. *Hab.* Ceylon, Guiana, Caripi, Java. Sporidia fusiform, curved, multiseptate, ·002 inch long. The single ostiolum is occasionally rimose.

743. M. MARGINATA, *Mont.*! *Syll.* p. 245. (439, 568, 569.)

On leaves and Palms. *Hab.* Cayenne.

744. M. PUNCTIFORMIS, *B. & C.* Minuta, subconica, atrofusca, rugosiuscula; sporidiis oblongis uniseptatis. (395.)

On leaves. Perithecia brown; cells minute; sporidia ·0006 inch long, ·0001 wide, hyaline.

745. M. ERUMPENS, *B. & C.* Peritheciis gregariis late conicis epidermidem stellatim ruptam nigrescentem ostiolo obtuso perforantibus; ascis longis linearibus; sporidiis uniserialibus fusiformibus uniseptatis apud commissuram contractis. (474, 556.)

On Palm-petioles. February. Sporidia ·0011 inch long, ·0003–·0004 wide. At first sight somewhat resembling *Pemphidium nitidum*, Mont., but in reality very different. In that species we find the sporidia biseriate, and of a different character.

SPHÆRIACEI.

CORDICEPS, *Fr. Lk.*

746. CORDICEPS SPHINGUM, *B. & C.*—Torrubia, *Tul. Sel. Fung. Carp.* iii. p. 12.—Isaria, *Schwein.* (433, 731, 732.)

On dead moths. *Hab.* United States, Europe.

747. C. MONTAGNEI, *B. & C.*—Isaria gigantea, *Mont. Cub.* p. 309.

On the body and feet of *Mygale cubana*, Walker. At present not observed in the perfect form.

748. C. FLAVELLA, *B. & C.* Gregaria, flavella; stipitibus filiformibus æqualibus pellucidis; capitulis globosis; peritheciis prominulis. (519.)

Among leaves on wood, growing apparently on some *Sclerotium*. December. About 1 inch high; stem filiform; head 1 line thick; asci slender. Allied to *C. myrmecophila*, Cesati.

There is an Ergot, no. 476, on *Setaria*; but of what *Cordiceps* it is a condition we have no information.

749. C. CALOCEROIDES, *B. & C.* Stipite elongato radicante furcato nitide rubro glabro; capitulo cylindrico subacuto elongato; peritheciis immersis, ostiolis prominulis. (309.)

On the ground. Nearly 5 inches high; head 2 inches long; not a line thick.

750. C. MILITARIS, *Fr. Lk. Handb.* iii. p. 347. (582.)
On dead insects. *Hab.* Upper Carolina, Europe.

751. C. SPHECOPHILA, *B. & C.* — Torrubia sphecophila, *Tul. l. c.* p. 16. (558, 520, 521.)
On wasps. *Hab.* Jamaica. No. 520 is apparently a very small variety, with a delicate filiform stem and fusiform head. We have not, however, seen perfect specimens.

HYPOCREA, *Fr.*

752. HYPOCREA SACCHARINA, *B. & C.* Stromate extus farinaceo, margine primum connivente demum aperto brevissime cylindrico; peritheciis apice primum depressis demum papillatis. (805.)
On dead wood. April. Gregarious, about 1 line across.

753. H. CERVINA, *B. & C.* Stromate irregulari suborbiculari plano, margine obtuso libero cervino subtomentoso, intus subconcolori; peritheciis superficialibus, ostiolis quandoque elongatis cylindricis; sporidiis subglobosis octonis. (773.)
On dead wood. Sporidia ·000014 inch in diameter. Stroma 2 lines across.

754. H. LÆTIOR, *B. & C.* Stromate orbiculari sublobato adnato læte cervino; peritheciis immersis, ostiolis prominulis nigris; sporidiis subglobosis 16. (518.)
On dead wood. Sporidia ·0002 inch in diameter, sixteen in each ascus. Stroma 1–1½ line across. Closely allied to the last.

755. H. INSIGNIS, *B. & C.* Stromate pezizæformi subhemisphærico e luteo cervino marginato, intus albo; disco plano, ostiolis minimis punctato; contextu celluloso. (516.)
On dead wood. Stroma ¼–⅛ inch across. Sporidia immature.

756. H. VIRIDANS, *B. & C.* Parva, pulvinata, e pallido-griseo viridis; ascis clavatis; sporidiis fusiformibus; ostiolis latitantibus. (450.)
On leaves of *Gesneria*. Scarcely a line across, composed of thick cylindrical branched gelatinous threads. Sporidia biseriate, fusiform, narrow, ·00057 inch long.

757. H. MACULÆFORMIS, *B. & C.* Tenuis, umbrina, irregularis, ostiolis brunneolis notata; peritheciis elongatis immersis. (767.)
On a hard, lemon-coloured, fleshy *Polyporus*, which is probably much altered by the parasite. Forming thin map-like spots.

Sporidia ·0004 inch long. No. 513 is probably the same thing with the parasite undeveloped.

758. H. ATRAMENTOSA, *B. & C.* Effusa, tenuis, elongata, atra, demum rugosa; peritheciis globosis ostiolisque immersis. (419.)

On leaves of grasses. *Hab.* Alabama. On *Andropogon*, no. 4018. Forming a thin stratum on the underside of the leaves. Allied to *H. semiamplexa*, B., a very similar species from Surinam on *Cyperaceæ*, with filiform sporidia (*Sphæria Cyperacearum*, Schwein.! herb.).

759. H. CITRINA, *Mont.*! *Cub.* p. 336. (568.)

On dead wood, *Polypori*, leaves, &c. *Hab.* Tasmania, Car. Inf., Europe.

SPHÆROSTILBE, *Tul.*

760. SPHÆROSTILBE GRACILIPES, *Tul. Sel. Fung. Carp.* i. p. 130. (734.)

On logs in woods. September. *Hab.* Europe.

761. S. WRIGHTII, *B. & C.* Soris orbicularibus, columellis striatis compressis nigris, capitulo carneo; sporis minutissimis; peritheciis confluentibus irregularibus; sporidiis oblongo-ellipticis. (801.)

On dead Palm-stems. January. Spores ·0001 inch long; sporidia ·0005 long, ·00025 wide, uniseptate. Spores just half the length of those in the last species, while the sporidia are longer, and not contracted at the commissure.

762. S. NITIDA, *B. & C.* Columella recta gracili lateritia; capitulo globoso hyalino ruguloso pallido. (739.)

On dead leaves and stems, apparently of some Orchid. December. We have not at present seen perithecia; but it must be congeneric with the following species.

763. S. CINNABARINA, *Tul. Sel. Fung. Carp.* i. p. 130.—Stilbum cinnabarinum, *Mont.*! *Cub.* p. 308. (499, 502, 550, 735, 740.)

On dead sticks. December. *Hab.* Ceylon, Louisiana, Car. Inf. No. 502 has the columella unusually fleshy and transparent.

764. S. LATERITIA, *B. & C.*—Stilbum lateritium, *B. Lond. Journ.* 1843, p. 642. (425.)

On dead sticks. *Hab.* E. Nepal, Ceylon, Hindustan, New Zealand, C. B. S., Car. Inf., Brazil. Columella simple in the Cuban specimens.

NECTRIA, *Fr.*

765. NECTRIA LÆTICOLOR, *B. & C.* Cæspitosa, coccinea, ovata, apice

obtuso, demum collapsa; sporidiis ellipticis uniseptatis. (458, 542, 555.)

On trees amongst *Hepaticæ*. February. Sporidia ·0006–·00057 inch long.

766. N. SACCHARINA, *B. & C.* **Cæspitosa vel subcongesta, saccharino-rufa, subhyalina, globosa; sporidiis subfusiformibus demum uniseptatis.** (341, 522, 553.)

On dead twigs of Coffee and fallen leaves. Sporidia ·0005–·0004 inch long.

767. N. DIPLOA, *B. & C.* **Cæspitosa; peritheciis aurantiacis furfuraceis; sporidiis biseriatis fusiformibus 2–4-nucleatis.** (606.)

On bark. *Hab.* Car. Inf., no. 4029. Sporidia ·0012–·001 inch long, ·00035 wide.

768. N. PITYRODES, *Mont.*=**Sphæria pityrodes,** *Mont. Cub.* p. 333.

On bark.

769. N. PERPUSILLA, *Mont.! Cub.* p. 335. (592, 593, 301.)

On dead *Xylariæ*. *Hab.* Europe.

770. N. SUBICULOSA, *B. & C.* **Peritheciis minutis pallide aurantiacis ovatis e strato tenui byssoideo aureo oriundis; sporidiis oblongis angustis uniseptatis.** (539.)

On dead *Polypori*. Sporidia ·0006 inch long, ·0002 wide. The sporidia in *Nectria aurea* (Grev. tab. 47) are much broader.

771. N. MACROSTOMA, *B. & C.* **Carnea; peritheciis tomento pallido inter se compactis, ostiolis demum elongatis.** (517.)

On dead bark. Forming little convex groups consisting of from five to twenty perithecia bound together by delicate down; more rarely scattered; ostiola elongated, thicker at the base; sporidia uniseptate, subelliptic, ·0004 long. All the ostiola are not elongated at the same time, except when there are very few in a group.

772. N. LAGENÆFORMIS, *B. & C.* **Peritheciis sparsis albidis, basi opacis, sursum hyalinis, lagenæformibus, collo elongato; sporis longis clavatis multiseptatis.** (629.)

On dead bark. Spores ·002 inch long. The ascigerous form of this species is unknown. The external characters are so remarkable that it cannot be confounded with any other. It can scarcely be a form of *N. hirta*, Blox., which is remarkable for its long multiseptate sporidia. *N. crustulina*, B. & Rav., like this is known only in its sporiferous state.

773. N. SUFFULTA, *B. & C.* **E pallido rufescens; peritheciis globo-**

sis dein collapsis, ostiolo papillæformi, floccis brevibus albidis quandoque fasciculatis suffultis; sporidiis oblongo-ellipticis demum uniseptatis. (632.)

Apparently on Palm-petioles. Sporidia ·0005 inch long.

774. N. COCCINEA, *Fr. Summ.*—**Sphæria coccinea,** *Pers. Syn.* p. 49. (549.)

On dead branches in woods. July. *Hab.* Tasmania, United States, Europe, Juan Fernandez, Java.

775. N. SANGUINEA, *Fr. Summ.*—**Sphæria sanguinea,** *Sibth. Fl. Ox.* p. 404.

On dead branches in woods with the last. July. *Hab.* Guiana, United States, Europe, Algeria.

776. N. FOLIICOLA, *B. & C.* **Parva, brunneola, furfuracea, pezizoidea, collapsa; ascis oblongis; sporidiis biserialibus lanceolatis uniseptatis.** (752.)

Apparently on leaves of *Musa.* Sporidia ·001 inch long, ·0001$\dot{6}$ wide.

777. N. LEIGHTONI, *B.* **Sparsa, minuta; peritheciis ovatis flavidis vel lurido-coccineis; sporidiis subcymbiformibus triseptatis hyalinis.** (641.)

On dead trees. June. *Hab.* Europe. Mr. Leighton's specimens are from Yorkshire, on Larch. Sporidia ·001 inch long.

XYLARIA, *Grev., Schrank.*

778. XYLARIA POLYMORPHA, *Grev.* t. 237. **Hypoxylon polymorphum,** *Mont. Cub.* p. 352. (298, 300, 305, 508, 587, 598, 600.)

On dead wood. *Hab.* Sikhim, Ceylon, Borneo, Australia, Tasmania, Brazil, Venezuela, Guiana, United States, Europe.

779. X. DIGITATA, *Grev. Fl. Ed.* p. 356. (301.)

On dead wood. *Hab.* Texas, United States, Europe.

780. X. RADICATA, *B. & C.*—**Sphæria radicata,** *Schwein.*! *herb.* (578.) **Cylindrica, simplex vel e radice longa tomentosa subcæspitosa oriunda, ex atropurpureo nigra, rugosa, leviter rimosa, ostiolis prominulis papillata; stipite brevissimo.**

On dead wood. *Hab.* Schweinitz's specimens have no locality indicated, but they are probably from Surinam. His *Sphæria cornu-damæ*, which somewhat resembles this, has narrow curved sporidia, ·001–·000$\dot{6}$ inch long; in this species they are cymbiform, ·0008–·000$\dot{6}$ inch long. Root 1–2 inches long, generally about the same length as the head.

781. X. CONOCEPHALA, *B. & C.* **Maxima, cæspitosa, e basi obtusa**

conica, umbrina, rimulosa, exsiccatione hic illic contracta; ostiolis sparsis prominulis; stipite brevi longitudinaliter sulcato-rugoso. (512.)

On dead wood. Stem ½ an inch, head 3½ high, 1¼ thick. Sporidia oblongo-cymbiform, ·0008–·0006 inch long.

782. X. ALLANTOIDEA, *B.*—Sphæria allantoidea, *Berk. Ann. Nat. Hist.* Aug. 1839, p. 397.—Hypoxylon allantoideum. *Mont. Cub.* p. 350. (306.)

On dead wood. *Hab.* Brazil, St. Domingo, Guiana.

783. X. TABACINA, *B. Hook. Lond. Journ.* vi. p. 225.—Hypoxylon tabacinum, *Kickx.* (595.)

On dead wood. *Hab.* Sikhim, Khasia, Xalapa, Surinam.

784. X. CUBENSIS, *B. & C.*—Hypoxylon cubense, *Mont. Cub.* p. 347, tab. 13. f. 1.

On dead wood. *Hab.* Guiana.

785. X. OBOVATA, *B.*—Sphæria obovata, *Berk. Ann. Nat. Hist. l. c.* (303, 507, 583, 596.)

On dead wood. *Hab.* Guiana, Venezuela. Very fragile, of a foxy tint within.

786. X. GRAMMICA, *Mont. Syll.* p. 202. (302, 307.)

On dead wood. *Hab.* St. Domingo.

787. X. WRIGHTII, *B. & C.* **Stipite cylindrico rimoso exsiccatione rugoso coffeato e basi spongiosa oriundo; capite subelliptico obtusissimo pallide rufo, deorsum præcipue lituris oblongis brunneis notato, ostiolis prominulis.** (308.)

On dead wood. Stem 1 inch high; head 1 inch high, 5 lines thick; sporidia cymbiform, ·0009 inch long.

788. X. FULVELLA, *B. & C.* **Clavata, rubiginosa, papillata; peritheciis semiprominulis, ostiolis nigris; stipite cylindrico pallide fulvo lineato-rugoso.** (590.)

On dead wood. *Hab.* Alabama (no. 4902). Sporidia oblong, ·0003 inch long. Closely allied to an Australian species, *X. phosphorea*, B., MS., but differs in the absence of the white ring round the ostiolum. The Cuban specimens are immature, so that the characters are drawn up from the Alabama plant.

789. X. HYPOERYTHRA, *Mont.*! *Syll.* p. 202. (597.)

On dead wood. *Hab.* Guiana.

790. X. RHOPALOIDES, *Mont.*—Hypoxylon, *Kze. in Weig. Exs.* (592, 593.)

On dead wood. *Hab.* Guiana, Amazon, Mexico. Sporidia ·00037 inch high.

791. X. CLAVULATA, *B. & C.*—Sphæria clavulata, *Schwein.*! *Trans. Am. Phil. Soc.* vol. iv. p. 188. (312.)

On dead wood. *Hab.* United States, Venezuela.

792. X. HYPOXYLON, *Grev. Fl. Ed.* p. 355. (292, 591.)
On dead wood. *Hab.* Cosmopolitan.

793. X. FLABELLIFORMIS, *B. & C.*—Sphæria flabelliformis, *Schwein. Journ. of Ac.* vol. v. tab. 1. f. 5; *Trans. Am. Phil. Soc.* vol. iv. p. 189; *Ravenel, Fung. Car. Exs.* n. 56.—Merisma nigripes, *Schwein. Syn. Car.* p. 85. (40 young, 294.)
On dead wood. *Hab.* Ceylon, Carolina. In its young state it is pink, and closely resembles a *Thelephora*, as for example *T. vialis*, Schwein.

794. X. DICHOTOMA, *Mont. Syll.* p. 204.—Hypoxylon dichotomum, *Mont.*! *Cub.* p. 351, tab. 13. f. 3. (589, 602.)
On dead wood. June.

795. X. MULTIPLEX, *B. & C.*—Hypoxylon multiplex, *Kze. in Weig. exs.* (293, 601.)
On dead wood. *Hab.* Java, New Zealand, Juan Fernandez, Guiana. Sporidia ·00086 inch long. No. 601 is a small variety growing amongst *Hymenophyllum*.

796. X. TENTACULATA, *Rav. MS.* no. 1300. Stipite tenui elongato gracili glabro; capitulo brevi cylindrico, ostiolis adscendentibus asperato; apice processibus flagelliformibus ornato. (585, 603, and in part 602.)
On decayed wood. June. *Hab.* South Carolina. 1½ inch high. No. 603 is a variety in which the processes have short patent branchlets resembling somewhat *X. comosa*, but without its velvety stem.

797. X. COMOSA, *Mont.*! *Syll.* p. 205.—Sphæria echinocephala, *Schwein.*! *MS.* (296, 297, 311.)
On dead wood. *Hab.* Guiana, Surinam, St. Domingo.

798. X. AXIFERA, *Mont.*! *Ann. d. Sc. Nat.* 1855, iii. p. 107. (510, 570.)
On dead petioles of *Sciadophyllum*. September. *Hab.* Guiana.

799. X. ARISTATA, *Mont.*! *Syll.* p. 205. (299, 514.)
On dead leaves of *Clusia*, &c. *Hab.* Guiana.

800. X. FILIFORMIS, *Fr. Summ.*—Sphæria filiformis, *A. & S.* p. 2. (604.)
On rotten wood, leaves, &c. *Hab.* Venezuela, South Carolina, Europe.

801. X. SCOPIFORMIS, *Mont. Ann. d. Sc. Nat.* 1840, xiii. p. 349. (290, 599.)
On roots and stumps in woods. June. *Hab.* Guiana, Surinam.

802. X. SCRUPOSA, *Mont.*!—Sphæria scruposa, *Fr. El.* ii. p. 55. Hypoxylon scruposum, *Mont. Cub.* p. 350. (291.)
On bark and dead wood.

803. X. MICROCERAS, *Mont.*!—Sphæria microceras, *Mont. Ann. d. Sc. Nat.* 1845, iii. p. 43. (289, 524.)
On dead wood. *Hab.* Guiana, Java.

804. X. HISPIDULA, *B. & C.* Stipite elongato æquali nigro floccis patentibus demum depressis vestito; capitulo subcylindrico obtuso subfulvo venis flexuosis nigris ornato; peritheciis prominulis. (526.)
On rotten wood. October. Stem 2 inches high; receptacle 1 inch high, attenuated and decurrent at the base; sporidia cymbiform, ·0006–·00057 inch long. Allied to *X. escharoides*, but abundantly distinct.

805. X. INÆQUALIS, *B. & C.* Receptaculo filiformi rugoso, peritheciis sparsis papilloso; e basi conica spongiosa oriunda. (605.)
On dead wood. Conical base 2 lines high, receptacle ¾ inch high; sporidia gibbous, rather pointed at either end, ·0006 inch long.

806. X. AURANTIACA, *B. & C.* Subglobosa, inflata, aurantiaca, polita, subtus pallidior, ostiolis impressis. (803.)
On the ground in woods without apparent attachment. The specimens are unfortunately not mature, but the species belongs to the same category as *X. compuncta*.

807. X. SPLENDENS, *B. & C.* Globosa, coccinea, exsiccatione rugosa, stipite brevissimo. (809.)
On the ground. An inch or more across. Nearly allied to the last, but, like that, immature.

CAMILLEA, *Fr.*

808. CAMILLEA BACILLUM, *Mont. Syll.* p. 207.—Hypoxylon bacillum, *Mont. Cub.* p. 348.
On bark. *Hab.* Guiana.

PORONIA, *Fr.*

809. PORONIA ŒDIPUS, *Mont.*! *Syll.* p. 20.—Hypoxylon Œdipus, *Mont.*! *Cub.* p. 346. (505.)
On dry cow-dung along the sandy beach. November. *Hab.* Guiana, Texas, Alabama, Europe.

HYPOXYLON, *Bull.*

810. HYPOXYLON (GLEBOSÆ) CŒNOPUS, *Mont.*! *Cub.* p. 341. (313, in part, 584.)

On dead bark. *Hab.* Ceylon, Philippines, Surinam, Brazil.

811. H. (GLEBOSÆ) CLAVUS, *Fr.*—Sphæria clavus, *Fr. in Linn.* v. p. 543. (493.)

On dead bark in woods. March. *Hab.* Ceylon, Brazil, St. Vincent's, Amazon.

812. H. (GLEBOSÆ) MICROPUS, *Fr.*—Sphæria micropus, *Fr. l.c.* p. 542. (332.)

On dead wood. *Hab.* Brazil. Sporidia cymbiform, ·00153–·0015 inch long, ·00038–·00056 inch wide.

813. H. (GLEBOSÆ) USTULATUM, *Bull.* t. 487. f. 1; *Mont. Cub.* p. 339. (325, 327, 328, 331.)

On dead wood. *Hab.* Juan Fernandez, Guiana, Venezuela, United States, Europe.

814. H. (GLEBOSÆ) DISCRETUM, *Schwein.*! *Syn.* p. 195. (576.)

On sticks. *Hab.* South Carolina. Sporidia broadly elliptic, ·00057 inch long.

815. H. (GLEBOSÆ) PLACENTIFORME, *B. & C.* Magnum, depresso-pulvinatum, margine inflexo libero, contextu nigro, superficie e rubiginoso nigra; peritheciis oblongis immersis, ostiolis papillæformibus. (324, 492.)

On dead wood. Stroma $1\frac{3}{4}$ inch across. Sporidia subelliptic, brown, ·0005 inch long.

816. H. (GLEBOSÆ) WRIGHTII, *B. & C.* Pulvinatum, margine inflexo libero, intus basin versus e flavo ferrugineum, alias brunneum, contextu radiante, superficie papillata; peritheciis subglobosis parvis, ostiolis latentibus. (330, 494.)

On logs. December. Stroma $1\frac{1}{2}$ inch across, $\frac{1}{8}$–$\frac{5}{12}$ inch thick.

817. H. (GLEBOSÆ) FRUSTULOSUM, *B. & C.* Minus, gregarium, irregulare, depressum, subtus centro excepto liberum, intus album suberosum, peritheciis immersis vel semiimmersis, ostiolis prominulis. (497.)

On dead wood. Asci straight, filiform, sporidia brown, ·0002 inch long, ·0001 broad.

818. H. (PULVINATÆ) CONCENTRICUM, *Grev.* t. 324; *Mont. Cub.* p. 340. (304, 496.)

On trunks of trees, &c. *Hab.* Sikhim, Ceylon, Borneo, Tasmania, New Zealand, United States, Europe.

819. H. (PULVINATÆ) VERNICOSUM, *Fr. Summ.*—Sphæria vernicosa, *Schwein. Act. Ac. Phil.* iv. p. 190. (314, 498, 545.)

On dead wood. *Hab.* Sikhim, United States, Europe.

Two very different forms occur:—the one, no. 545, with a hard outer coat, and prominent ostiola; the other, no. 498, with impressed ostiola and more easily crushed. Both agree in the lacunose, white, concentric layers, which resemble the internal substance of *D'Urvillea*, and in the size of the sporidia, which are ·0008 inch long, and ·00025 wide. Neither form is so much varnished as in specimens from other localities,

820. H. (PULVINATÆ) BOMBA, *Mont.*! *Cub.* p. 338, tab. 12. fig. 3.

On dead fallen bark.

821. H. (PULVINATÆ) SAGRÆANUM, *Mont. Cub.* p. 341, tab. 12. fig. 4.

On dead fallen bark. *Hab.* Nicaragua, U. S. E. E. Sporidia ·0004 inch long.

822. H. (PULVINATÆ) PETERSII, *B. & C.* Stromate pulvinato hemisphærico duro ex umbrino nigro, intus umbrino; peritheciis stratosis elongatis; superficie papillosa, ostiolis minutis nigris. (329.)

On dead wood. *Hab.* Alabama. Stroma 1 inch across, $\frac{1}{3}$ thick. Surface, at length, sometimes cracked, so as to show the internal umber tint. Sporidia ·0003 inch long.

823. H. (PULVINATÆ) SUBEROSUM, *B. & C.* Globosum, superficie minutissime areolato-rimosa subrubiginosa, contextu albo suberoso; peritheciis globosis immersis, ostiolis latentibus. (319.)

On dead wood. Stroma $1\frac{1}{2}$ line across.

824. H. (PULVINATÆ) AREOLATUM, *B. & C.* Hemisphæricum, superficie areolata, cute durissima, contextu nigro; ostiolis sparsis demum prominulis; sporidiis obtusis. (586.)

On bushes in woods. February. Stroma $\frac{1}{3}$ inch across, sporidia obtuse at either end, ·00137–·0012 inch long.

825. H. (PULVINATÆ) COCCINEUM, *Bull.*—Sphæria fragiformis, *Pers. Syn.* p. 9. (325, 579.)

On dead wood, and parasitic on *Hypoxylon ustulatum*. *Hab.* Soane River, Tasmania, United States, Arctic America, Europe.

826. H. (PULVINATÆ) HÆMATOSTROMA, *Mont.*! *Cub.* p. 344. (317, 321.)

On dead wood.

827. H. (PULVINATÆ) RUBRICOSUM, *Mont.*! *Syll.* p. 212. (320.)

On dead wood. *Hab.* Swan River, Chili, Guiana, Car. Inf.

828. H. (PULVINATÆ) LUCIDULUM, *Mont.*! *Syll.* p. 213. (313, with a dwarf form of *H. cœnopus.*)

On dead wood. *Hab.* Guiana.

829. H. (PULVINATÆ) POLYSPERMUM, *Mont.*! *Cub.* p. 345.

On dead wood and bark.

830. H. (PULVINATÆ) MARGINATUM, *Schwein. Syn.* p. 190. (499.)

On dead bark. *Hab.* Venezuela, United States. The Cuban specimens belong to the effused form, exactly what appeared some years since in the conservatory at Chatsworth.

831. H. (EFFUSÆ) LENORMANDI, *B. & C.* Peritheciis parvis connatis coffeato-pruinosis, ostiolo parum notato; ascis linearibus; sporidiis uniseriatis cymbiformibus. (486.)

On dead wood. *Hab.* Tahiti, where it was gathered by Messrs. Vieillard and Panchet in 1855, and communicated to one of us by Monsieur Lenormand. Sporidia ·001 inch long.

832. H. (EFFUSÆ) PALMIGENA, *B & C.* Peritheciis depressis furfuraceo-subtomentosis rugosis nigris in glomerulos parvos congestis, ostiolo papillæformi; sporidiis hyalinis. (488, 573.)

On Palm-leaves, sometimes with *Meliola glabra.* February. Perithecia 5–6 in each sorus; sporidia gibbous, ·0008–·0006 inch long.

833. H. (EFFUSÆ) RUBIGINOSUM, *Fr. Summ.*—Sphæria rubiginosa, *Pers. Syn.* p. 11. (495.)

On dead wood. *Hab.* Tauria, Texas, Car. Sup., Europe.

834. H. (EFFUSÆ) UMBRINO-VELATUM, *B. & C.* Peritheciis subhemisphæricis subapplanatis circa ostiolum papillæforme leviter depressis, umbrino-velatis, parce confluentibus; sporidiis magnis cymbiformibus. (344.)

On dead wood. Sporidia ·00153–·0015 inch long.

835. H. (EFFUSÆ) FUSCO-PURPUREUM, *Schwein. Syn.* p. 192; *Journ. of Ac.* tab. 2. fig. 11.

On dead wood. *Hab.* United States. Sporidia ·0005 inch long.

836. H. (EFFUSÆ) ALLANTOSPORUM, *B. & C.* Peritheciis parvis innumeris dense catervatis obovatis fuscis; ostiolo papillato; sporidiis allantiformibus magnis. (334.)

On dead bark. Sporidia ·002 inch long.

837. H. (EFFUSÆ) INVESTIENS, *Schwein.*! *Syn.* p. 193. (490.)

On dead wood. *Hab.* Texas, United States.

DIATRYPE, *Fr.*

838. DIATRYPE (LIGNOSÆ) ANTHRACODES, *B. & C.* Sphæria anthracodes, *Fr. in Linn.* v. p. 544. (318, 322.)

On recently felled trees. *Hab.* Venezuela, Guiana.

839. D. (LIGNOSÆ) MICROPLACA, *B. & C.* Tenuis, orbicularis, hypophlœa, ostiolis minutis papillæformibus parce notata. (323.)

On dead bark. *Hab.* Car. Inf. The South-Carolina fungus is on *Laurus sassafras*, the Cuban on some plant smelling strongly of Benzoin. There is a closely allied species from South Carolina (*D. hypophlœa*) on *Magnolia*, with larger ostiola and narrower sporidia.

840. D. (LIGNOSÆ) VERRUCÆFORMIS, *Fr. Summa.*—Sphæria verrucæformis, *Ehr. Cryp. Ex.* no. 280. (338, 470.)

On dead sticks. *Hab.* United States, Europe. Asci containing indefinite sporidia.

841. D. (VERSATILES) HYSTRIX, *Fr. Summa.*—Sphæria hystrix, *Tode, Fung. Meck.* ii. 53. (484.)

On dead sticks. *Hab.* United States, Europe. Sporidia sausage-shaped, ·00025 inch long, ·00017 wide.

842. D. (EFFUSÆ) RUFICARNIS, *B. & C.* Peritheciis aggregatis hic illic in pustulas irregulares minutas erumpentibus; stromate rufo; sporidiis allantoideis. (342.)

On Congo-bean. In different parts of the same matrix the perithecia form pustules; in others they form raised patches, as in *D. lata*. Ostiola where developed papillæform. Sporidia ·0005 inch long.

VALSA, *Fr.*

843. VALSA STELLULATA, *Fr. Summa.*—Sphæria stellulata, *Fr. Syst.* ii. p. 380. (340.)

On dead sticks. *Hab.* Surinam, United States, Europe. Sporidia sausage-shaped, ·0004–·0003 inch long, ·00015 wide. It is one of the commonest species in the United States.

SPHÆRIA, *Hall.*

844. SPHÆRIA (BYSSISEDÆ) ACTINODES, *B. & C.* Parasitica; floccis fasciculatis radiantibus nigris; peritheciis ovatis sursum in ostiolum papillæforme contractis; ascis ovato-lanceolatis; sporidiis longis linearibus acuminatis curvulis multiseptatis. (544.)

On some imperfect orbicular *Hypoxylon*. Sporidia ·003 inch long.

845. S. (BYSSISEDÆ) SEPULTA, *B. & C.* Hyphasmatis effusi fibris non aculeatis; peritheciis parvis immersis; sporidiis magnis subfusiformibus. (777.)

On Palms. *Hab.* Venezuela. Sporidia ·002 inch long. Resembles externally *S. acanthostroma*, Mont., which occurs in South Carolina on trunks of Oak, Maple, *Myrica*, &c. In the Cuban specimens the tips of the threads are often covered with an amorphous white substance of a crystalline appearance.

846. S. (BYSSISEDÆ) IMMUNDA, *B. & C.* Gregaria, hyphasmate parco atro; peritheciis globosis floccis aterrimis depressis vestitis; ostiolo papillæformi emergente; sporidiis magnis cymbiformibus. (538.)

On trees in thick woods. February. Sporidia monostichous, ·002–·0013 inch long, rather acute at one extremity.

847. S. (BYSSISEDÆ) FOVEOLATA, *B. & C.* Late effusa, stromate nigerrimo, floccorum ramulis apice acutis; peritheciis globosis demum collapsis pilis rigidis ornatis; sporidiis hemisphæricis foveolatis. (489, 548.)

On dead bark. August. *Hab.* Car. Inf., no. 1358. November. Sporidia ·0002 inch in diameter, shaped like the seeds of a *Veronica*. Resembles externally *S. pezizula*, B. & C., a South-Carolina species, which, however, has sausage-shaped multiseptate sporidia ·0013 inch long, and without the acute ramuli.

848. S. (BYSSISEDÆ) SUBÆNEA, *B. & C.* Aggregata, e stromate fusco oriunda; peritheciis globosis coffeatis, ostiolo papillæformi minuto; sporidiis breviter subcymbiformibus. (485.)

On dead bark. Sporidia ·0005 inch long, ·0002 wide.

849. S. (BYSSISEDÆ) MELIOLOIDES, *B. & C.* Soris orbicularibus; hyphasmate radiante delicato, demum pulvere cinnabarino plus minus peritheciisque globosis obsitis. (471, 574.)

On the underside of coriaceous leaves. Sporidia immature. A very beautiful species.

850. S. (DENUDATÆ) MARCESCENS, *B. & C.* Gregaria; peritheciis ovatis rugosis, ostiolo papillæformi, lateraliter compressis; ascis linearibus; sporidiis fuscis cymbiformibus. (339.)

On dung. Sporidia ·0006–·0008 inch long, ·000014 wide. There are a few brown threads at the base.

851. S. (PERTUSÆ) COFFEICOLA, *B. & C.* Nuda; peritheciis late conicis glabris; ascis clavatis; sporidiis hyalinis biarticulatis, articulo superiore conico parvo, inferiore subelliptico. (616.)

On dead twigs of Coffee. February. Sporidia ·001 inch long.

The large joint varies greatly in breadth. Their form is that of the sporidia of *S. apiospora*, Mont.

852. S. (PERTUSÆ) INÆQUABILIS, *B. & C.* Sparsa, erumpens; peritheciis late conicis; sporidiis ellipticis hinc appendiculatis. (617.)

On dead twigs of Coffee. February. Sporidia ·0006 inch long. Appendage short, obtuse. Differs from the last in its erumpent habit and shorter spores. It is curious to find two species so closely allied on the same matrix.

853. S. (PERTUSÆ) OBTUSISSIMA, *B. & C.* Sparsa, superficialis; peritheciis subconicis tornatis obtusissimis, ostiolo minuto vix conspicuo. (483.)

On dead wood. Unfortunately this very distinct species is without fruit; but the shining extremely obtuse perithecia separate it from others of the section. It is just intermediate between PERTUSÆ and DENUDATÆ.

854. S. (CÆSPITOSÆ) PROTEUS, *B. & C.* Stromate pulvinato conidiis ellipticis obsito, aliis aciniformibus e floccis enatis; peritheciis rugosiusculis collapsis; sporidiis linearibus utrinque acuminatis multiseptatis. (196.)

On dead bark. The substance of the stroma under the microscope has a reddish tinge and sends out threads, which are crowned with conidia.

855. S. (CERATOSTOMÆ) ROSTRATA, *Fr. Syst.* iii. p. 473. (482.)

On dead wood. *Hab.* United States, Europe.

856. S. (CERATOSTOMÆ) DOLICHOSTOMA, *B. & C.* Peritheciis ligno immersis; collo longissimo setaceo atro polito; ascis lanceolatis; sporidiis filiformibus demum septatis. (541, 580.)

On dead wood. February. Sporidia ·003 inch long. No. 506 is a variety with longer and more slender sporidia, ·004 inch long.

857. S. (OBTECTÆ) ABDITA, *B. & C.* Gregaria, epidermide tecta, cortice immersa; ascis brevibus; sporidiis late cymbiformibus quaternis cornicoloribus. (432,)

On stem of Congo-bean. Sporidia ·001–·0006 inch long, ·0005–·0003 wide.

858. S. (OBTECTÆ) MEGALOSPORA, *Mont.*! *Syll.* p. 229. (528, 575.)

On dead sticks. *Hab.* Guiana. No. 575 is also an imperfect *Xylaria*; the number possibly ought to be 529.

859. S. (OBTECTÆ) NIGRANNULATA, *B. & C.* Peritheciis epidermide circum nigra medio pallida tectis; ascis linearibus; sporidiis uniseriatis oblongo-subellipticis fuscis. (337.)

On dead leaves, apparently of some *Yucca*. *Hab.* Car. Sup., no. 4915, on leaves of *Yucca aloifolia*. Sporidia ·0006–·0005 inch long, ·0003 broad.

860. S. (OBTECTÆ) OPULENTA, *D. N. Mic. It.* i. 12. (552.)

On fronds of some *Cactus*. May. *Hab.* Europe.

861. S. (CAULICOLÆ) SUBGEMINA, *B. & C.* Gregaria; peritheciis subglobosis subtectis, ostiolo papillæformi subcompresso libero; ascis clavatis; sporidiis uniserialibus lanceolatis curvulis uniseptatis, articulis subbinucleatis. (469.)

On stems of grass. Perithecia often connate. Sporidia ·0005 inch long. There is a species in the collection, no. 794, resembling externally *Sphæria complanata*, but without fruit, accompanied by an obscure *Phoma* and *Cladosporium*.

862. S. (FOLIICOLÆ) COFFEIGENA, *B. & C.* Sparsa; peritheciis subhemisphæricis vel late conicis, ostiolo minuto; ascis clavatis; sporidiis biserialibus fuscis, bi- vel demum triseptatis. (479.)

On leaves of Coffee. December. Accompanying Lichens and *Jungermanniæ*. Sporidia ·0005 inch long, ·00014 wide. There is also a *Depazea* on Coffee-leaves (742), but without fruit.

863. S. (FOLIICOLÆ) SUBMACULANS, *B. & C.*—Stigmea submaculans, *Mont. Cub.* p. 329.

On dead leaves.

GIBBERA, *Fr.*

864. GIBBERA PULICARIS, *Fr. Summ.*—Sphæria pulicaris, *Fr. in Kz. Myc.* Heft ii. p. 37. (420.)

On stems of Indian Corn. *Hab.* New Zealand, United States, Algeria, Europe.

DOTHIDEA, *Fr.*

865. DOTHIDEA REPENS, *Berk. in Hook. Journ.* 1854, p. 231.—Sphæria repens, *Cd.* (470, 476.)

On leaves of Sapindaceæ. December. *Hab.* Hindustan, Ceylon, on *Ficus religiosa*.

866. D. PHYLLOPLACA, *Mont. Syll.* p. 223.—Sphæria phylloplaca, *Kze. in Weig. Exs.* (474.)

On leaves. *Hab.* Surinam.

867. D. COCCODES, *Fr. Summ.*—Sphæria coccodes, *Lév. Ann. d. Sc. Nat.* 1845, iii. p. 50. (473, 536, 543.)

On leaves of *Oreodaphne* and *Cerasus*. January, March, May. *Hab.* Brazil, on leaves of Leguminosæ.

In the young state it has obovate or elliptic conidia, and has,

in fact, the characters of *Epicoccum*, ·005 inch long, ·0002 wide. Probably a distinct species, of which we have only the Conidiiferous form (468, 472, 551), occurs on leaves of *Nectandra* in May, with conidia ·0001–·0008 inch long.

868. D. GRAMMODES, *Fr. Summ.*—Sphæria grammodes, *Kze. in Weig. Exs.*—Actidium Crotalariæ, *Schwein.* ! *MS.* (475.)

On leaves of *Crotalaria*. June. *Hab.* Bombay, Ceylon, Surinam. Sporidia oblong, slightly attenuated at either end, uniseptate, constricted at the commissure, ·0006 inch long, uniseriate. We find in some cells linear oblong stylospores and delicate curved spermatia, ·001 inch long. We have three closely allied species on different *Crotalariæ*, and a fourth on *Rhyncosia*.

869. D. GRAMINIS, *Fr. Summ.*—Sphæria graminis, *Pers. Obs.* i. p. 18.

On leaves of grass. *Hab.* Deccan, Uitenhage, Ceylon, United States, Arctic America, Europe.

870. D. PULVERULENTA, *B. & C.* Stromate orbiculari parvo, cellulis prominulis albido- vel rufulo-pulverulentis omnino tecto; ostiolo nigro; ascis clavatis; sporidiis oblongis vel clavatis quandoque curvulis uniseptatis. (481.)

On leaves of *Styrax*. February. Sporidia ·001 inch long, ·0002–·00016 inch wide, hyaline.

871. D. ANOMALA, *B. & C.* Pulvinata, nigra; stromate toto e floccis dichotomis articulis moniliformibus compacto; ascis brevibus clavatis vel subglobosis; sporidiis subglobosis. (614.)

On the underside of Fern-fronds. Fertile cells surrounded at the base with short obtuse hairs; conidia subfusiform, terminal; sporidia minute.

872. D. BASI-RUFA, *B. & C.* Stromate pulvinato e basi tenui rufa oriundo nigro glabro; cellulis abditis; ascis sublanceolatis; sporidiis oblongis uniseptatis. (765.)

On the underside of Fern-fronds. Oblong or orbicular, small. Asci broader at the base; sporidia ·0005 inch long, ·000125 broad.

873. D. MILLEPUNCTATA, *B. & C.* Cellulis fertilibus gregariis submersis epidermide demum rupta cinctis e macula pallida oriundis; ascis ellipticis brevibus subtetrasporis, pedicello gracili flexuoso; sporidiis oblongo-ellipticis uniseptatis. (532.)

On leaves of *Clusia parasitica*. October. Sporidia ·0003 inch long, ·000083 wide.

874. D. NITIDISSIMA, *B. & C.* Stromate parvo orbiculari, cellulis sparsis piceis nitentibus; sporidiis ellipticis hyalinis. (389.)

On the upper surface of dead leaves. Sporidia ·0003 inch long by ·0001 broad.

875. D. ALOETICA, *B. & C.* Stromate lato orbiculari piceo, cellulis pustulatis conicis; sporidiis ellipticis latis hyalinis. (390.)

On the upper hairy surface of leaves. Cells about twenty in each patch, which is about 2 lines wide; sporidia ·00057 inch long, ·00038 wide.

CAPNODIUM, *Mont.*

876. CAPNODIUM MAXIMUM, *B. & C.* Peritheciis elongatis nitidis nigris setiformibus hic illic inflatis apice capitulatis, e mycelio parco oriundis; ascis clavatis longe pedicellatis; sporidiis octonis globosis. (414, 757, 786.)

On the sori of *Polypodia.* January, February. Perithecia with a few short threads on the outer wall. Sporidia ·0002 inch in diameter. Conidia oblong, slightly reniform. The asci appear to be attached to the walls principally where the perithecia are swollen. At first sight this very curious species resembles a *Sphærostilbe.*

PERISPORIACEI.

EUROTIUM, *Lk.*

877. EUROTIUM HERBARIORUM, *Lk. Obs.* i. p. 29, f. 44; *Mont. Cub.* p. 306.

On dead leaves. *Hab.* Europe.

MELIOLA, *Fr.*

878. MELIOLA AMPHITRICHA, *Fr. Syst. Obs. Veg.* p. 111; *Mont. Cub.* p. 326. (391, 397, 398, 449, 609, 613.)

On leaves, as of Palms, *Abutilon*, *Amyris*, *Cladium occidentale*, &c. December, February. *Hab.* New Zealand, Surinam, St. Domingo, Texas, Alabama, Car. Inf.

879. M. FURCATA, *Lév. Ann. d. Sc. Nat.* April 1846, p. 266. (392, 393, 460, 463, 490, 491.)

On leaves of various plants, as Piperaceæ and *Clematis.* *Hab.* Nicaragua, Guiana. Flocci of conidiiferous plant olivaceous, slender; spores elongato-clavate, triseptate, ·001 inch long when mature, cladosporioid.

880. M. ORBICULARIS, *B. & C.* **Soris crassiusculis orbicularibus; setis curvatis crassis obtusis; sporidiis quadriseptatis. (557.)**

On branches of trees, near the top. February. Stroma orbicular, consisting of thick obtuse threads; perithecia globose, surrounded by thick curved and flexuous bristles; sporidia ·0025 to ·002 inch long.

881. M. WRIGHTII, *B. & C.* **Soris tenuibus hypophyllis olivaceis; floccis flexuosis cladosporioideis; conidiis cymbiformibus articulatis; peritheciis floccis æquilongis obtusis cinctis. (561.)**

On leaves apparently of some sapindaceous plant. February. Conidia often attached lengthwise to the appendages, ·00125 inch long, triseptate. Sporidia ·0016 inch long, quadriseptate.

882. M. ZIGZAC, *B. & C.* **Floccis repentibus confervoideis, articulis utrinque emarginatis obliquis; peritheciis setis acutis tenuibus curvulis cinctis; sporidiis magnis, conidiis helminthosporoideis triseptatis utrinque appendiculatis. (478.)**

On leaves. Sporidia ·002 inch long; conidia ·0016. The flocci are very peculiar.

883. M. GLABRA, *B. & C.* **Stromate confervoideo depresso adnato subglabro; peritheciis globosis, appendiculis brevibus verrucæformibus. (406, 413, 487, 563.)**

On leaves of Rubiaceæ &c. Sporidia ·00163 inch long, sometimes pointed at either end, when mature two in each ascus, one having been absorbed.

884. M. LÆVIS, *B. & C.* **Stromate orbiculari atramentario e floccis adpressis lobatis oriundo; peritheciis minutis demum collapsis. (376.)**

On smooth coriaceous leaves. Lobes fasciculate; sporidia like those of *M. amphitricha.*

885. M. SEMINATA, *B. & C.* **Stromate parvo compacto e pilis lobatis; peritheciis totum stroma occupantibus verrucosis, appendiculis setaceis. (775.)**

On leaves of *Palicourea.* December.

886. M. CORALLINA, *Mont. Syll.* p. 255; *Mont. Cub.* p. 330. (612 in part.)

On leaves. *Hab.* Juan Fernandez.

Note.—**The numbers in small figures refer to the first-sent collection.**

On the Character and Hybrid-like Nature of the Offspring from the Illegitimate Unions of Dimorphic and Trimorphic Plants.

By CHARLES DARWIN, M.A., F.R.S., F.L.S., &c.

[Read Feb. 20, 1868.]

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VARIOUS plants, which I have called dimorphic and trimorphic, have been described by me in papers read before this Society *. But it may be convenient to recall as briefly as possible the meaning of these terms. Dimorphic species consist of two forms, which naturally exist in about equal numbers: in the long-styled form the pistil is always longer, and the stamens (excepting in the case of *Linum grandiflorum*) are shorter than in the other form. Conversely, in the short-styled form the pistil is shorter and the stamens longer than in the long-styled form. In the latter the pollen-grains are almost always of larger size than in the short-styled form. The sexual union of the two distinct forms is necessary for full fertility: such unions I formerly called heteromorphic; but, for reasons which will immediately appear, it is more convenient to speak of them as legitimate, and the offspring thus produced, as ordinarily occurs in nature, as legitimate. When long-styled or short-styled plants are impregnated with their own-form pollen, the union is not fully fertile, or is even absolutely barren. Such unions, and the offspring raised from them, may be called illegitimate. Thus two legitimate and two illegitimate unions can be effected.

With trimorphic species, the case is more complex. There are three forms, which differ greatly in the length of the pistil; and in each form two sets of stamens exist, differing in length, in the

* "On the two Forms, or Dimorphic Condition, in the species of *Primula*," Journal of Proceedings, Bot. vol. vi. (1862) p. 77. "On *Linum*," ibid. vol. vii. (1864) p. 69. "On *Lythrum salicaria*," ibid. vol. viii. 1864, p. 169.

size of the pollen-grains, and often in colour. The stamens are graduated in length, so that one of the two sets in two of the forms is equal in length to the pistil in the third form. For instance, in the long-styled form the pistil equals in length the longer set of stamens in the mid-styled and short-styled forms. In all three forms the union is fully fertile and legitimate only when the pistil is impregnated with pollen from the stamens which equal it in length. Thus the long-styled form can be legitimately fertilized only by the longer stamens of the mid-styled or short-styled form; it can be illegitimately fertilized by its own two sets of stamens, and by the shorter stamens of both the mid-styled and short-styled forms; so that the long-styled form can be fertilized legitimately in two ways and illegitimately in four ways. The same holds good with the mid-styled and short-styled forms; hence with trimorphic species eighteen unions are possible, of which six are legitimate, and produce legitimate offspring, and twelve are illegitimate and produce illegitimate offspring.

I will give the results of my experiments on the illegitimate offspring of various dimorphic and trimorphic plants in full detail, partly because the observations are extremely troublesome, and will not probably soon be repeated (thus I have been compelled to count under the microscope above 20,000 seeds of *Lythrum Salicaria*), but chiefly because much light is thus indirectly thrown on the important subject of hybridism.

Lythrum Salicaria.

I will commence with this trimorphic species. Of the twelve illegitimate unions, two were completely barren; and I succeeded in raising seedlings from only six, or doubtfully from seven, of the remaining ten illegitimate unions. The experiments are arranged in classes according to the parentage of the plants. In each case I give the average number of seeds per capsule, generally taken from ten capsules, which, according to my experience, is a nearly sufficient number. I give also in each case the maximum number of seeds in any one capsule; and this is a useful point of comparison with the normal standard—that is, with the number of seeds produced by legitimate plants when legitimately fertilized. I give likewise in each case the minimum number. When the maximum and minimum differ greatly, and no remark is made on the subject, it may be understood that the extremes are so closely connected by intermediate figures that the average is fair. Large

capsules were always selected for counting, in order to avoid over-estimating the infertility of the several illegitimate plants. The plants were generally allowed to be freely and legitimately fertilized, through the agency of bees, by illegitimate plants belonging to the two other forms growing close by. This is the fairest plan, and was generally followed; but in several cases (which will always be stated) illegitimate plants were fertilized by pollen taken from legitimate plants belonging to the other two forms; and this, as might have been expected, increased their fertility. Unfortunately *Lythrum Salicaria* is much affected in its fertility by the nature of the season; and to avoid, as far as possible, error from this source, my observations were extended over several years. Some few experiments were tried in 1863. The summer of 1864 was too hot and dry, and, though the plants were copiously watered, some few apparently suffered in their fertility, whilst others were not in the least affected. The years 1865 and, especially, 1866, were highly favourable. Only a few observations were made during 1867.

In order to judge of the degree of infertility of the various illegitimate plants, the following statement of the average and maximum number of seeds produced by ordinary or legitimate plants, when legitimately fertilized, some artificially and some naturally, will serve as a standard of comparison, and may in each case be referred to. But in order to save trouble, I have given under each experiment the percentage of seeds to the nearest whole number, as calculated in comparison with the standard number of the same form.

Standards.

Long-styled form; average number of seeds in each capsule 93; *maximum number observed in twenty-three capsules*, 159.

Mid-styled form; average number of seeds, 130; *maximum number observed in thirty-one capsules*, 151.

Short-styled form; average number of seeds, 83·5; *but we may, for the sake of brevity, say* 83; *maximum number observed in twenty-five capsules*, 112.

CLASS I. *Illegitimate plants from the long-styled form, fertilized by pollen from the longer or shorter stamens of the same form.*

From this union I raised at different times three lots of seedlings, amounting altogether to 56 plants. I must premise that, from not foreseeing the result, I did not keep a memorandum whether the eight plants of the first lot were the product of the

longer or shorter stamens of the same form; but I have reason to suspect that they were the product of the latter. These eight plants were much more dwarfed, and much more sterile than those in the other two lots. The latter were raised from a long-styled plant growing quite isolated and fertilized by the agency of bees with its own pollen; and it is almost certain, from the relative position of the organs of fructification, that the stigma under these circumstances would be fertilized by pollen from the longer stamens.

All the fifty-six plants in these three lots proved long-styled; now, if the parent plants had been legitimately fertilized by pollen from the longer stamens of the mid-styled or short-styled forms, about one-third alone of the seedlings would have been long-styled, and the other two-thirds would have been mid-styled and short-styled. In some other trimorphic and dimorphic genera we shall find the same curious and inexplicable fact, namely that the long-styled form, fertilized by its own-form pollen, produces almost exclusively long-styled seedlings *.

The eight plants of the first lot were of low stature: three which I measured attained, when fully grown, the heights of only 28, 29, and 47 inches; whilst a legitimate plant growing close by reached the height of 77 inches. They all betrayed in their general appearance a weak constitution; they flowered rather later in the season, and at a later age than ordinary plants. Some did not flower every year; and one plant, in an unprecedented manner, did not flower until three years old. In the two other lots none of the plants grew quite to their full and proper height, as could at once be seen by comparing them with the adjoining rows of legitimate plants. In several plants in all three lots, many of the anthers were either shrivelled or contained brown and tough, or pulpy matter, without any good pollen-grains, and they never shed their contents; they were in the state designated by Gärtner † as contabescent, which term I will for the future use. In one flower all the anthers were contabescent excepting two, which appeared to the naked eye sound; but under the microscope about two-thirds of the pollen-grains were seen to be small and shrivelled. In another plant, in which all the anthers appeared sound, many of the pollen-grains were shrivelled

* Dr. Hildebrand first called attention (Bot. Zeitung, Jan. 1, 1864, S. 5) to this subject in the case of *Primula sinensis*; but his results were not nearly so uniform or striking as mine.

† Beiträge zur Kenntniss der Befruchtung, 1844, S. 116.

and of unequal sizes. I observed, under the circumstances immediately to be stated, the number of seeds produced by six plants (*Exp.* I to VI.) in the first lot of eight plants, and by three plants in each of the other two lots belonging to the present class.

Experiment I. This long-styled plant was allowed during 1863 to be freely and legitimately fertilized by an adjoining illegitimate mid-styled plant, but it did not yield a single seed-capsule. It was then removed and planted in a remote place close to a brother long-styled plant No. II., so that it must have been freely though illegitimately fertilized; under these circumstances it did not yield during 1864 and 1865 a single capsule. I should here state that a *legitimate* or ordinary long-styled plant, when growing isolated and freely, though illegitimately fertilized by insects with its own pollen, yielded an immense number of capsules, which contained on an average 21·5 seeds.

Exp. II. This long-styled plant, after flowering during 1863 close to an illegitimate mid-styled plant, produced less than twenty capsules, which contained on an average between four and five seeds. When subsequently growing in company with No. I., by which it will have been illegitimately fertilized, it yielded in 1866 not a single capsule, but in 1865 it yielded twenty-two capsules: the best of these, fifteen in number, were examined; eight contained no seed, and the remaining seven contained on an average only three seeds, and these seeds were so small and shrivelled that I doubt whether they would have germinated.

Exp. III. & IV. These two long-styled plants, after being freely and legitimately fertilized by the same illegitimate mid-styled plant during 1863 were as miserably sterile as No. II.

Exp. V. This long-styled plant, after flowering in 1863 close to the illegitimate mid-styled plant, yielded only four capsules, which altogether included only five seeds. During 1864, 1865, and 1866, it was surrounded either by illegitimate or legitimate plants of the other two forms; but it did not yield a single capsule. It was a superfluous experiment, but I likewise artificially fertilized in a legitimate manner twelve flowers; but not one produced a capsule; so that this plant is almost absolutely barren.

Exp. VI. This long-styled plant, after flowering during the favourable year of 1866, surrounded by illegitimate plants of the other two forms, did not produce a single capsule.

Exp. VII. This long-styled plant was the most fertile of the eight plants of the first lot. During 1865 it was surrounded by illegitimate plants of various parentage, many of which were highly fertile,

and must thus have been legitimately fertilized. It produced a good many capsules, ten of which yielded an average of 36·1 seeds, with a maximum of 47 and a minimum of 22; so that this plant produced 39 per cent. of the full number of seeds. During 1864 it was surrounded by legitimate and illegitimate plants of the other two forms; and nine capsules (one poor one being rejected) yielded an average of 41·9 seeds, with a maximum of 56, and a minimum of 28; so that, under these favourable circumstances, this plant, the most fertile of the first lot, did not yield, when legitimately fertilized, quite 45 per cent. of the full complement of seeds.

In the second lot of plants in the present class, descended from the long-styled form fertilized by its own pollen, and almost certainly from the longer stamens, the plants, as already stated, were not nearly so dwarfed or so sterile as in the first lot. All produced plenty of capsules. I counted the number of seeds in only three plants, viz. Nos. VIII., IX., & X.

Exp. VIII. This plant was allowed to be freely fertilized in 1864 by legitimate and illegitimate plants of the other two forms, and yielded from ten capsules an average of 41·1 seeds, with a maximum of 73 and a minimum of 11. Hence this plant produced only 44 per cent. of the full complement of seeds.

Exp. IX. This long-styled plant was allowed in 1865 to be freely fertilized by illegitimate plants of the other two forms, most of which were moderately fertile. Fifteen capsules yielded an average of 57·1 seeds, with a maximum of 86 and a minimum of 23. Hence the plant yielded 61 per cent. of the full complement of seeds.

Exp. X. This long-styled plant was freely fertilized at the same time and in the same manner as the last. Ten capsules yielded an average of 44·2 seeds, with a maximum of 69 and a minimum of 25; hence this plant yielded 47 per cent. of the full complement of seeds.

The nineteen long-styled plants of the third lot, of the same parentage as the last lot, were treated differently; for they flowered during 1867 by themselves, so that they must have been illegitimately fertilized by each other. It has already been stated that a legitimate long-styled plant, growing by itself and visited by insects, yielded an average of 21·5 seeds per capsule, with a maximum of 35; but, to judge fairly of its fertility, this plant, as well as others, ought to have been observed during successive seasons. We may infer from analogy that, if several legitimate long-styled plants were to fertilize each other, the average number

of seeds would be increased; but how much increased I do not know; hence I have no perfectly fair standard of comparison by which to judge of the fertility of the three following plants of the present lot, the seeds of which I counted.

Exp. XI. This long-styled plant produced a large crop of capsules, and seemed to be one of the most fertile of the whole lot of nineteen plants. The average from ten capsules was 35·9 seeds, with a maximum of 60 and a minimum of 8.

Exp. XII. This and the following long-styled plant produced very few capsules; ten yielded an average of only 15·4 seeds, with a maximum of 30 and a minimum of 4.

Exp. XIII. This plant offers an anomalous case; for it flowered profusely, but produced very few capsules; yet these capsules contained numerous seeds. Ten capsules yielded an average of 71·9 seeds, with a maximum of 95 and a minimum of 29. Considering that this plant was illegitimate, and illegitimately fertilized by its brother long-styled seedlings, the average and the maximum are so remarkably high that I cannot at all understand the case.

CLASS II. *Illegitimate plants from the short-styled form, fertilized by pollen from the shorter stamens of the same form.*

I raised from this union nine plants, of which eight were short-styled and one long-styled; so that there seems to be a strong tendency with this form to reproduce, when self-fertilized, the parent form; but the tendency is not so strong as with the long-styled. These nine plants never attained the full height of legitimate plants growing close to them. The anthers in many of the flowers on several plants were contabescent.

Exp. XIV. This short-styled plant was allowed during 1865 to be freely and legitimately fertilized by illegitimate plants descended from self-fertilized mid-, long- and short-styled plants. Fifteen capsules yielded an average of 28·3 seeds, with a maximum of 51 and a minimum of 11. The seeds themselves were small and irregular in shape; hence this plant produced only 33 per cent. of the proper number of seeds. Although so sterile on the female side, none of its anthers were contabescent.

Exp. XV. This short-styled plant, treated like the last during the same year, yielded an average, from fifteen capsules, of 27 seeds with a maximum of 49 and a minimum of 7. But two poor capsules may be rejected, and then the average rises to 32·6, with the same maximum of 49 and a minimum of 20; so that this plant attained 38 per cent. of the normal standard of fertility

and was rather more fertile than the last, yet many of the anthers were contabescent.

Exp. XVI. This short-styled plant, treated like the two last, yielded from ten capsules an average of 77·8 seeds, with a maximum of 97 and a minimum of 60; so that this plant produced 94 per cent. of the full number of seeds.

Exp. XVII. This, the one long-styled plant of the same parentage as the last three plants, when freely and legitimately fertilized in the same manner as the last, yielded an average from ten capsules of 76·3 rather poor seeds, with a maximum of 88 and a minimum of 57. Hence this plant produced 82 per cent. of the proper number of seeds. Twelve flowers under a net were artificially and legitimately fertilized by pollen from a legitimate short-styled plant; and nine capsules yielded an average of 82·5 seeds, with a maximum of 98 seeds and a minimum of 51; so that its fertility was increased by the action of pollen from a legitimate plant, but still did not reach the normal standard.

Class III. *Illegitimate plants from the mid-styled form fertilized by pollen from the longer stamens of the same form.*

After two trials, I succeeded in raising only four plants from this illegitimate union. These proved to be three mid-styled and one long-styled; but from so small a number we can hardly judge of the tendency in mid-styled plants when self-fertilized to reproduce the same form. These four plants never attained their full and normal height; the long-styled plant had several of its anthers contabescent.

Exp. XVIII. This mid-styled plant, when freely and legitimately fertilized during 1865 by illegitimate plants descended from self-fertilized long-, short-, and mid-styled plants, yielded an average from ten capsules of 102·6 seeds, with a maximum of 131 and a minimum of 63: hence this plant did not produce quite 80 per cent. of the normal number of seeds. Twelve flowers were artificially and legitimately fertilized by pollen from a legitimate long-styled plant, and yielded from nine capsules an average of 116·1 seeds, which were finer than in the previous case, with a maximum of 135 and a minimum of 75; so that, as in *Exp.* XVII., pollen from a legitimate plant increased the fertility, but did not bring it up to the full standard.

Exp. XIX. This mid-styled plant, fertilized in the same manner and at the same period with the last, yielded an average from ten capsules of 73·4 seeds, with a maximum of 87 and a minimum of 64; hence this plant produced only 56 per cent. of the full number

of seeds. Thirteen flowers were artificially and legitimately fertilized by pollen from a legitimate long-styled plant, and yielded ten capsules with an average of 95·6 seeds; so that the application of pollen from a legitimate plant added, as in the two previous cases, to the fertility, but did not bring it up to the proper standard.

Exp. XX. This long-styled plant, of the same parentage with the last two mid-styled plants, and freely fertilized in the same manner, yielded an average from ten capsules of 69·6 seeds, with a maximum of 83 and a minimum of 52; hence the plant produced 75 per cent. of the full number of seeds.

CLASS IV. *Illegitimate plants from the short-styled form fertilized by pollen from the longer stamens of the long-styled form.*

In the three previous classes, plants raised from the three forms fertilized by pollen from either the longer or shorter stamens of the same form, but not of the same individual plant, have been described. Six other illegitimate unions are possible, namely between the three forms and the stamens in the other two forms which do not correspond in height with the pistil. But I succeeded in raising plants from only three of these six unions. From one of them, forming the present Class, twelve plants were raised; these consisted of eight short-styled, and four long-styled plants, with not one mid-styled. These twelve plants never attained quite their full and proper height, but by no means deserved to be called dwarfs. The anthers in some of the flowers were contabescent. One plant was remarkable from all the longer stamens in every flower and from many of the shorter stamens having their anthers in this condition. The pollen of four other plants, in which none of the anthers were contabescent, was examined; in one a moderate number of grains were minute and shrivelled, but in the other three they appeared perfectly sound. With respect to the power of producing seed, five plants (*Exps.* XXI. to XXV.) were observed: one yielded scarcely more than half the normal number; a second was slightly infertile; but the three others actually produced a larger average number, with a higher maximum, than the standard. In my concluding remarks on *Lythrum* I shall recur to this fact, which at first appears inexplicable.

Exp. XXI. This short-styled plant, freely and legitimately fertilized during 1865 by illegitimate plants, descended from self-fertilized long-, mid- and short-styled parents, yielded an average from ten capsules of 43 seeds, with a maximum of 63 and a minimum of 26; hence this plant, which was the one with all its

longer and many of its shorter stamens contabescent, produced only 52 per cent. of the proper number of seeds.

Exp. XXII.—This short-styled plant produced perfectly sound pollen, as viewed under the microscope. During 1866 it was freely and legitimately fertilized by other illegitimate plants belonging to the present and the following class, both of which include many highly fertile plants. Under these circumstances it yielded from eight capsules an average of 100·5 seeds, with a maximum of 123 and a minimum of 86; so that it produced 121 per cent. of seeds in comparison with the normal standard. During 1864 it was allowed to be freely and legitimately fertilized by *legitimate* and illegitimate plants, and yielded an average, from eight capsules, of 104·2 seeds, with a maximum of 125 and a minimum of 90; consequently it produced 125 per cent. of the normal standard. In this case, as in some previous cases, pollen from legitimate plants added in a small degree to the fertility of the plant; and the fertility would, perhaps, have been still greater had not the summer of 1864 been very hot, and certainly unfavourable to some of the plants of *Lythrum*.

Exp. XXIII.—This short-styled plant produced perfectly sound pollen. During 1866 it was freely and legitimately fertilized by the other illegitimate plants specified under the last experiment, and yielded an average, from eight capsules, of 113·5 seeds, with a maximum of 123 and a minimum of 93. Hence this plant produced no less than 136 per cent. of the normal standard.

Exp. XXIV.—This long-styled plant produced pollen which seemed under the microscope sound; but some of the grains did not swell when placed in water. During 1864 it was legitimately fertilized by *legitimate* and illegitimate plants in the manner described under Exp. XXII., but yielded an average, from ten capsules, of only 55 seeds, with a maximum of 88 and a minimum of 24, thus attainining 59 per cent. of the normal fertility. This low degree of fertility, I presume, was owing to the unfavourable season; for during 1866, when legitimately fertilized by *illegitimate* plants in the manner described under Exp. XXII., it yielded an average, from eight capsules, of 82 seeds, with a maximum of 120 and a minimum of 67, thus producing 88 per cent. of the normal number of seeds.

Exp. XXV.—The pollen of this long-styled plant contained a moderate number of poor and shrivelled grains; and this is a surprising circumstance, as it yielded an extraordinary number of seeds. During 1866 it was freely and legitimately fertilized by

illegitimate plants, as described under Exp. XXII., and yielded an average, from eight capsules, of 122·5 seeds, with a maximum of 149 and a minimum of 84. Hence this plant produced no less than 131 per cent. of the normal standard.

CLASS V.—*Illegitimate plants from the mid-styled form, fertilized by pollen from the shorter stamens of the long-styled form.*

I raised from this union twenty-five plants, which proved to be seventeen long-styled and eight mid-styled, but not one short-styled. None of these plants were in the least dwarfed. I examined, during the highly favourable season of 1866, the pollen of four plants: in one mid-styled plant, some of the anthers of the longer stamens were contabescent, but in the other anthers the pollen-grains were mostly sound, as they were in all the anthers of the shorter stamens; in two other mid-styled and in one long-styled plant many of the pollen grains were small and shrivelled; and in the latter plant as many as a fifth or sixth appeared to be in this state. I counted the seeds in five plants (Exp. XXVI. to XXX.), of which two were moderately sterile and three fully fertile.

Exp. XXVI.—This mid-styled plant was freely and legitimately fertilized, during the rather unfavourable year 1864, by numerous surrounding legitimate and illegitimate plants. It yielded an average, from ten capsules, of 83·5 seeds, with a maximum of 110 and a minimum of 64, thus attaining 64 per cent. of the normal fertility. During the highly favourable year 1866, it was freely and legitimately fertilized by illegitimate plants belonging to the present Class and to Class IV., and yielded an average, from eight capsules, of 86 seeds, with a maximum of 109 and a minimum of 61, and thus attained 66 per cent. of the normal fertility. This was the plant with some of the anthers of the longer stamens contabescent as above mentioned.

Exp. XXVII.—This mid-styled plant, fertilized during 1864 in the same manner as the last, yielded an average, from ten capsules, of 99·4 seeds, with a maximum of 122 and a minimum of 53, thus attaining to 76 per cent. of the normal fertility. If the season had been more favourable, its fertility would probably have been somewhat greater, but, judging from the last experiment, only in a slight degree.

Exp. XXVIII.—This mid-styled plant, when legitimately fertilized during the favourable season of 1866, in the manner described under Exp. XXVI., yielded an average, from eight capsules, of 89 seeds, with a maximum of 119 and a minimum of 69, thus

producing 68 per cent. of the full number of seeds. In the pollen of both sets of anthers, nearly as many grains were small and shrivelled as sound.

Exp. XXIX.—This long-styled plant was legitimately fertilized during the unfavourable season of 1864, in the manner described under Exp. XXVI., and yielded an average, from ten capsules, of 84·6 seeds, with a maximum of 132 and a minimum of 47, thus attaining to 91 per cent. of the normal fertility. During the highly favourable season of 1866, when fertilized in the manner likewise described under Exp. XXVI., it yielded an average, from nine capsules (one poor capsule having been excluded), of 100 seeds, with a maximum of 121 and a minimum of 77. This plant thus exceeded the normal standard, and produced 107 per cent. of seeds. In both sets of anthers there were a good many bad and shrivelled pollen-grains, but not so many as in the last-described plant.

Exp. XXX.—This long-styled plant was legitimately fertilized during 1866 in the manner described under Exp. XXVI., and yielded an average, from eight capsules, of 94 seeds, with a maximum of 106 and a minimum of 66; so that it attained 101 per cent. of the normal fertility.

Exp. XXXI.—Some flowers on this long-styled plant were artificially and legitimately fertilized by one of its brother mid-styled plants; and five capsules yielded an average of 90·6 seeds, with a maximum of 97 and a minimum of 79. Hence, as far as can be judged from so few capsules, this plant attained, under these favourable circumstances, 98 per cent. of the normal standard.

CLASS VI.—*Illegitimate plants from the mid-styled form fertilized by pollen from the longer stamens of the short-styled form.*

I have shown, in my former paper on *Lythrum Salicaria*, that the union from which these illegitimate plants were derived is far more fertile than any other illegitimate union; for the mid-styled parent, when thus fertilized, yielded an average (all very poor capsules being excluded) of 102·8 seeds, with a maximum of 130; and the plants in the present class accord in character with the but slightly lessened fertility of the parent-union. I raised forty plants; and these attained their full height and were covered with seed-capsules. Nor did I observe any contabescent anthers. It deserves, also, particular notice that these plants, differently from what occurs in any previous class, consisted of all three forms, namely eighteen short-styled, fourteen long-styled, and eight mid-styled plants. From these circumstances, I counted the seed in

only two plants (Exp. XXXII. & XXXIII.), which proved fully fertile.

Exp. XXXII.—This mid-styled plant was freely and legitimately fertilized, during the rather unfavourable year of 1864, by numerous surrounding legitimate and illegitimate plants. Eight capsules yielded an average of 127·2 seeds, with a maximum of 144 and a minimum of 96; so that this plant attained 98 per cent. of the normal standard.

Exp. XXXIII.—This short-styled plant was fertilized in the same manner and at the same time with the last; and ten capsules yielded an average of 113·9, with a maximum of 137, and a minimum of 90. Hence this plant produced no less than 137 per cent. of seeds in comparison with the standard.

Concluding remarks on the illegitimate offspring of the three forms of Lythrum salicaria.

From the three forms occurring in approximately equal numbers in a state of nature, and from the results of sowing seed naturally produced, there is reason to believe that each form when legitimately fertilized, reproduces all three forms in about equal numbers. Now we have seen (and the fact is a very singular one) that the fifty-six plants produced from the long-styled form, when illegitimately fertilized by pollen from the same form (Class I.), were all long-styled. The short-styled form, when self-fertilized (Class II.), produced eight short-styled and one long-styled plant; and the mid-styled form, similarly treated (Class III.), produced three mid-styled and one long-styled offspring; so that these two forms, when illegitimately fertilized by pollen from the same form, evince a strong, but not exclusive, tendency to reproduce the parent-form. When the short-styled form was illegitimately fertilized by the long-styled form (Class IV.), and again when the mid-styled was illegitimately fertilized by the long-styled (Class V.), in each case the two parent-forms alone were reproduced. As thirty-seven plants were raised from these two unions, we may, with much confidence, believe that it is the rule that plants thus produced yield both parent-forms but not the third form. When, however, the mid-styled form was illegitimately fertilized by the short-styled (Class VI.), the same rule did not hold good; for the seedlings consisted of all three forms, but in unequal numbers. Nor is this exception surprising; for the illegitimate union from which these seedlings were derived is, as previously stated,

singularly fertile, and the seedlings themselves exhibit no signs of sterility, and grow to their full height.

Tabulated results of the fertility of the foregoing illegitimate plants, when legitimately fertilized, generally by illegitimate plants, as described under each experiment. Experiments XI., XII., & XIII. are excluded; for these plants were illegitimately fertilized.

Number of Experiment and Standard.	Form.	Average number of seeds produced.	Maximum number in any one capsule.	Minimum number in any one capsule.	Calculated average of seeds relatively to the normal standard, this being taken in each case as 100.
Standard.........	Long-styled	93	159	No record was kept; but all excessively poor capsules were rejected.	
Do.	Mid-styled...	130	151		
Do.	Short-styled	83·5	112		

Class I.—*Illegitimate plants from the long-styled form, fertilized by pollen from the longer or shorter stamens of the same form.*

Experiment I.	Long-styled	0	0	0	0
II.	Do.	4·5	...	...	5
III.	Do.	4·5	...	...	5
IV.	Do.	4·5	...	...	5
V.	Do.	0 or 1	...	...	0 or 1
VI.	Do.	0	...	...	0
VII.	Do.	36·1	47	22	39
VIII.	Do.	41·1	73	11	44
IX.	Do.	57·1	86	23	61
X.	Do.	44·2	69	25	47

Class II.—*Illegitimate plants from the short-styled form, fertilized by pollen from the shorter stamens of the same form.*

Exp. XIV.	Short-styled	28·3	51	11	33
XV.	Do.	32·6	49	20	38
XVI.	Do.	77·8	97	60	94
XVII.	Long-styled	76·3	88	57	82

Class III.—*Illegitimate plants from the mid-styled form, fertilized by pollen from the longer stamens of the same form.*

Exp. XVIII.	Mid-styled...	102·6	131	63	80
XIX.	Do.	73·4	87	64	56
XX.	Long-styled	69·6	83	52	75

TABLE (*continued*).

CLASS IV.—*Illegitimate plants from the short-styled form, fertilized by pollen from the longer stamens of the long-styled form.*

Number of Experiment.	Form.	Average number of seeds produced.	Maximum number in any one capsule.	Minimum number in any one capsule.	Calculated average of seeds relatively to the normal standard, this being taken in each case as 100.
Exp. XXI.	Short-styled	43·0	63	26	52
XXII.	Do.	100·5	123	86	121
XXIII.	Do.	113·5	123	93	136
XXIV.	Long-styled	82·0	120	67	88
XXV.	Do.	122·5	149	84	131

CLASS V.—*Illegitimate plants from the mid-styled form, fertilized by pollen from the shorter stamens of the long-styled form.*

Exp. XXVI.	Mid-styled...	86·0	109	61	66
XXVII.	Do.	99·4	122	53	76
XXVIII.	Do.	89·0	119	69	68
XXIX.	Long-styled	100·0	121	77	107
XXX.	Do.	94·0	106	66	101
XXXI.	Do.	90·6	97	79	98

CLASS VI.—*Illegitimate plants from the mid-styled form, fertilized by pollen from the longer stamens of the short-styled form.*

Exp. XXXII.	Mid-styled...	127·2	144	96	98
XXXIII.	Short-styled	113·9	137	90	137

The lessened fertility of most of these illegitimate plants is in many respects a highly remarkable phenomenon. Thirty-three plants in the six classes were subjected to various trials, and the seeds carefully counted. Some were artificially fertilized, but the far greater number were freely fertilized (and this is the better and natural plan) through the agency of insects, by other illegitimate plants. In the right-hand or percentage column in the accompanying Table, a wide difference in fertility between the plants in the first three and the last three classes may be perceived. In the first three classes the plants are descended from the three forms illegitimately fertilized by pollen taken from the same form, but not from the same individual plant. It is necessary to observe this latter circumstance; for, as I shall at some future time show *, most plants, independently of dimor-

* I have given a brief abstract of some of these observations in my work on 'The Variation of Animals and Plants under Domestication,' 1867, vol. ii. p. 128.

phism or trimorphism, when fertilized with their own pollen, are in some degree dwarfed, and sometimes rendered sterile. None of the nineteen plants in the first three classes attained complete fertility; one, however, made a near approach, yielding 96 per cent. of the proper number of seeds. From this high degree of fertility we have many descending gradations, till we reach an absolute zero, when the plants, though bearing many flowers, did not produce, during successive years, a single seed or even seed-capsule. Some of the most sterile plants did not yield a single seed, even when legitimately fertilized by pollen from legitimate plants. The first seven plants in Class I., which are by far the most sterile, probably ought to form a distinct class from the three following plants; for there is reason to suspect that the former are the product of the shorter stamens of the long-styled form, whilst it is almost certain that the latter are descended from the longer stamens of the same form; but, owing to this doubt, they are all arranged under the same class. The several classes differ in their average degree of fertility; and in the same class there is a wide difference in the fertility of the several plants, though descended from the same parents, sown at the same time, and grown in the same soil. None of the plants in the first three classes attained their full and proper stature; the first seven plants, which, as already stated, probably ought to form a distinct class, are by far the most dwarfed, several of them never reaching to half their proper height. These same plants did not flower at so early an age, or so early in the season, as they ought to have done. The anthers in many of their flowers, and in the flowers of some other plants in the first five classes, were either contabescent or included numerous small and shrivelled pollen-grains. As the suspicion at one time occurred to me that the lessened fertility of all the illegitimate plants might be due to the pollen alone being affected, I may remark that this is certainly not the case; for several of them, when fertilized by sound pollen from legitimate plants, did not yield the full complement of seeds; hence it is certain that both the female and male reproductive organs are affected.

Turning now to the fourth, fifth, and sixth classes, and looking to the right-hand column of the Table, we find nearly as many plants with a percentage of seeds above the standard as beneath it. Hence, at first sight, it appears probable that the number of seeds ordinarily produced is much more variable than I have supposed, and, consequently, that the plants in these three classes do not really differ

in their power of yielding seed, but have merely varied temporarily in fertility. Nevertheless we may reject this conclusion as far as the less fertile plants are concerned,—first, because none of the plants in Class IV. attained their proper height, which shows that they were in some manner affected; and, secondly, because many of the plants in Classes IV. & V. produced anthers which were either contabescent or included small and shrivelled pollen-grains. And as in these cases the male organs were manifestly deteriorated, it is by far the most probable conclusion that the female organs were likewise affected, and that this was the cause of the reduced number of seeds.

With respect to the three short-styled and three long-styled plants in the three latter classes, which yield too high a percentage of seeds, the explanation is much more doubtful. The normal standard for the long-styled form was deduced by counting the seeds in twenty-three capsules, and for the short-styled form from twenty-five capsules. I do not pretend that this is a sufficient number of capsules for absolute accuracy; but my experience leads me to believe that a very fair result would thus be gained. As, however, the maximum number observed in the twenty-five capsules of the short-styled form is low, the standard in this case may possibly be not quite high enough. In the case of the illegitimate plants, in order to avoid overestimating their infertility, ten very fine capsules were always selected; and the years 1865 and 1866, during which the plants in the three latter classes were observed, were highly favourable for seed-production. Now, if this plan of selecting very fine capsules during favourable seasons had been followed for obtaining the normal standards, instead of taking, during various seasons, the first capsules which came to hand, the standards would undoubtedly have been considerably higher; and thus the fact of the six foregoing plants appearing to yield an unnaturally high percentage of seeds may, perhaps, be accounted for. On this view, these plants are, in fact, merely fully fertile, and not fertile to an abnormal degree. Nevertheless, as characters of all kinds are liable to variation, especially with organisms unnaturally treated, and as in the three first and more sterile classes, the plants derived from the same parents, and treated in the same manner, certainly did vary much in sterility, it is possible that certain plants, in the latter and more fertile classes, may have varied so as to have acquired an abnormal degree of fertility. But it should be especially observed that, if my standards err in being too low, the sterility of all the many sterile

plants in the several classes, will have to be estimated higher in the same proportion. Finally, we see that the illegitimate plants in the three first classes are all more or less sterile, some being absolutely barren, with one alone almost completely fertile; in the three latter classes, some of the plants are moderately sterile, whilst others are fully fertile or possibly fertile in excess.

The last point which need here be noticed is that, as far as my means of comparison serve, a certain degree of relation exists between the infertility of the illegitimate first unions between the several forms and that of their illegitimate offspring. Thus the two illegitimate unions, from which the seedlings in Classes V. & VI. were derived, yielded a fair amount of seed, and only a few of these plants are in any degree sterile. On the other hand, the illegitimate unions between plants of the same form always yield very few seeds, and their seedlings are the most sterile. But the relation is not strict; for the first six or seven plants in the Table were extremely sterile, out of all proportion to the union from which they were derived. There is also a tolerably close parallelism in each class between the degree of sterility and the dwarfed stature of the plants. As previously stated, an illegitimate plant fertilized by pollen from a legitimate plant has its fertility slightly increased. The importance of the several foregoing conclusions will be apparent at the close of this paper, when the illegitimate unions between the forms of the same species, and their illegitimate offspring, are compared in functional power with the hybrid unions and the hybrid offspring of distinct species.

Genus Oxalis.

Dr. Hildebrand * has proved that *Oxalis rosea* is a trimorphic species, like *Lythrum Salicaria*. He possessed in the living state the long-styled form alone, and from its seeds, necessarily self-fertilized, he raised seedlings which proved all long-styled; but, unfortunately, he does not state how many plants were raised.

Genus Primula.

Primula sinensis.

I raised during February 1862, from some long-styled plants

* Ueber den Trimorphismus in der Gattung Oxalis: Monatsberichte der Akad. der Wissen. zu Berlin, 21st June 1866, p. 373. Also published separately.

illegitimately fertilized by pollen from the same form, twenty-seven seedlings. These were all long-styled. They proved fully fertile or even fertile in excess; for ten flowers, fertilized by pollen from other plants of the same lot, yielded nine capsules, containing on an average 39·75 seeds, with a maximum number in one capsule of sixty-six seeds. Again four of these flowers legitimately crossed by pollen from a legitimate plant, and four flowers on the latter crossed by pollen from the illegitimate seedlings, yielded seven capsules with an average of fifty-three seeds, with a maximum of seventy-two. I must here state that I have found some difficulty in estimating the standard of fertility for the several unions of this species, as the results differed much during successive years*, and the seeds vary so greatly in size that it is hard to decide which ought to be considered good. In order to avoid overestimating the infertility of the several illegitimate unions, I have taken as low standards as possible.

From the foregoing twenty-seven plants, fertilized by their own-form pollen, I raised twenty-five seedling grandchildren; and these were all long-styled; so that from the two illegitimate generations fifty-two plants were raised, and all without exception proved long-styled. These grandchildren grew vigorously and soon exceeded in height two other lots of illegitimate seedlings of different parentage and one lot of equal-styled seedlings presently to be described. Hence I expected that they would turn out highly ornamental plants; but when they flowered, they seemed, as my gardener remarked, to have gone back to the wild state; for the petals were pale-coloured, narrow, sometimes not touching each other, flat, generally deeply notched in the middle, but not flexuous on the margin, and with the yellow eye

* Dr. Hildebrand was much more successful than I was in fertilizing the flowers of *P. sinensis*; yet the number of seeds obtained by him is certainly much too low. Thus he gives (Bot. Zeitung, 1864, p. 3) eighteen seeds as the average number produced by the long-styled form, when illegitimately fertilized by the same-form pollen, and forty-one as the number when legitimately fertilized. For the short-styled form, the corresponding numbers are twenty and forty-four. The lowest standards which I can give for the illegitimate and legitimate unions of the long-styled form are thirty-five and at least fifty, and for the short-styled at least twenty-five and sixty-four. It is possible that Dr. Hildebrand's plants were grown in too small pots, or, whilst maturing their seeds, were otherwise treated in an unfavourable manner. This would account for the greater inequality observed by him than that by me between the product of seeds from the legitimate and illegitimate unions, as the latter always suffer most from unfavourable conditions.

or centre conspicuous. Altogether these flowers, in comparison with those of their progenitors, presented a striking difference, which can, I think, be accounted for only on the principle of reversion. One of these grandchildren had most of its anthers contabescent. Seventeen of the flowers were illegitimately fertilized by pollen taken from seedlings of the same lot, and produced fourteen capsules, containing on an average 29·2 seeds; they ought to have contained about thirty-five seeds. Fifteen flowers legitimately fertilized by pollen from an illegitimate short-styled plant (belonging to the lot next to be described) produced fourteen capsules, containing an average of forty-six seeds; they ought to have contained at least fifty seeds. Hence these grandchildren of illegitimate descent appear to have lost, though only in a very slight degree, their full fertility.

From a short-styled form of *P. sinensis*, fertilized by its own-form pollen, I raised, during February 1862, eight seedlings, seven of which were short-styled and one long-styled. These plants grew slowly, and never attained to the full stature of ordinary plants; some of them flowered precociously, and others late in the season. Four flowers on the short-styled plants and four on the long-styled plant were illegitimately fertilized with their own-form pollen and produced only three capsules, containing on an average 23·6 seeds, with a maximum of twenty-nine; but we cannot judge of their fertility from so few capsules; and I have greater doubts about the normal standard for this union than about the standard for the three other unions; but I believe that rather above twenty-five seeds would be a fair estimate. Eight flowers on the short-styled and long-styled illegitimate plants were reciprocally and legitimately crossed; they produced five capsules which contained an average of 28·6 seeds, with a maximum of thirty-six. A reciprocal cross between legitimate plants of the two forms would have yielded an average of at least fifty-seven seeds, with a possible maximum of seventy-four seeds; so that these illegitimate plants are sterile when legitimately crossed.

I succeeded in raising from the seven short-styled illegitimate plants, fertilized by their own-form pollen, only six plants—grandchildren of the first union. These, like their parents, were of low stature, and had so poor a constitution that four died before flowering. With ordinary plants it has been a rare event with me to have more than a single plant die out of a large lot. The two grandchildren which lived and flowered were short-styled; and twelve of their flowers were fertilized with their own-form pollen

and produced twelve capsules containing an average of 28·2 seeds; so that these two plants, though belonging to so weakly a set, were rather more fertile than their parents, and perhaps not at all sterile. Four flowers on the same two grandchildren were legitimately fertilized by a long-styled illegitimate plant, and produced four capsules, containing only 32·2 seeds instead of about sixty-four seeds, which is the normal average I have obtained from legitimate short-styled plants legitimately crossed.

By looking back, it will be seen that at first I raised from a short-styled plant fertilized by its own-form pollen seven short-styled plants and one-long styled. These illegitimate plants of the two forms were legitimately crossed, and from their seed fifteen plants were raised, grandchildren of the first illegitimate union. According to analogy half of them ought to have been long-styled and half short-styled; but all were short-styled. Altogether, of the twenty-five plants illegitimately descended from the short-styled grandparent, twenty-four proved to be short-styled and one alone long-styled. Twelve short-styled flowers borne by the fifteen grandchildren were fertilized by pollen taken from plants of the same form belonging to the same lot, and produced eight capsules which contained an average of 21·8 seeds, with a maximum of thirty-five. These figures are rather below the normal standard for such a union. Six flowers were also legitimately fertilized by an illegitimate long-styled plant and produced only three capsules, containing on an average 23·6 seeds with a maximum of thirty-five. Such a union in the case of a legitimate plant ought to have yielded an average of sixty-four seeds, with a possible maximum of seventy-three seeds.

Summary on the transmission of form, constitution, and fertility of the illegitimate offspring of Primula sinensis.—In regard to the long-styled form, the illegitimate offspring, as far as my experience during two generations of fifty-two plants serves *, appear invariably to be long-styled. These plants grew vigorously; but the flowers in one instance were small, appearing as if they had reverted to the wild state. In the first illegitimate generation they were perfectly fertile, and in the second their fertility was only very slightly impaired. With respect to the short-styled

* Dr. Hildebrand (Bot. Zeitung, 1864, p. 5) raised from a similar illegitimate union seventeen plants, of which fourteen were long-styled and three short-styled. From a short-styled plant illegitimately fertilized by its own pollen he raised fourteen plants, of which eleven were short-styled and three long-styled.

form, twenty-four out of twenty-five of their illegitimate offspring were short-styled. They were dwarfed in stature, and one lot of grandchildren had so poor a constitution that four out of six plants perished before flowering. The two survivors, when illegitimately fertilized by their own-form pollen, were rather less fertile than they ought to have been; but their loss of fertility was clearly shown in a special and unexpected manner, namely when legitimately fertilized by other illegitimate plants: thus altogether eighteen flowers fertilized in this manner yielded twelve capsules, which included on an average only 28·5 seeds, with a maximum of forty-five. Now a legitimate short-styled plant would have yielded, when legitimately fertilized, an average of sixty-four seeds, with a possible maximum of seventy-four. This particular kind of infertility will perhaps be best appreciated by a simile: we may assume that six children would on an average be born from each ordinary marriage; but that only three would be born from an incestuous marriage. Now, according to the analogy of *Primula sinensis*, the children of such incestuous marriages, if they continued to marry incestuously, would have their sterility only slightly increased; but their fertility would not be restored by a proper marriage; for if two children, both of incestuous origin, but in no degree related to each other, were to marry, the marriage would of course be strictly legitimate, nevertheless they would not give birth to more than half the full and proper number of children.

Equal-styled variety of Primula sinensis.—As any variation in the structure of the reproductive organs, combined with changed function, is a rare event, the following cases are worth giving in detail. Mr. Scott, in his excellent paper on the reproductive functions in the Primulaceæ*, has recorded some analogous facts. My attention was first called to the subject by observing, in 1862, a long-styled plant, descended from a self-fertilized long-styled parent, with some of its flowers in an anomalous state, namely, with the stamens placed low down in the corolla as in the ordinary long-styled form, but with the pistils so short that the stigmas stood on a level with the anthers. These stigmas were nearly as globular and as smooth as in the short-styled form, instead of being elongated and rough as in the long-styled form. Here, then, we have stamens of the long-styled form and a pistil closely resembling that of the short-styled form combined in the same flower. But

* Journal of Proc. Linn. Soc. Bot. vol. viii. (1864) p. 78.

the structure varied much on the same umbel: for in two flowers the pistil was intermediate in length between that of the long- and that of the short-styled form, with the stigma elongated as in the former, and smooth as in the latter; and in three other flowers the structure was in all respects like that of the long-styled form. These modifications appeared to me so remarkable that I fertilized eight of the flowers with their own pollen, and obtained five capsules, which contained on an average forty-three seeds; and this number shows that the flowers had become abnormally fertile in comparison with those of ordinary long-styled plants when self-fertilized. These facts led me to examine the plants in several small collections, with the following result, showing that the equal-styled variety is not rare.

Name of Owner or Place.	Long-styled Form.	Short-styled Form.	Equal-styled Variety.
Mr. Horwood	0	0	17
Mr. Duck	20	0	9
Baston	30	18	15
Chichester	12	9	2
Holwood	42	12	0
High Elms	16	0	0
Westerham	1	5	0
My own plants from purchased seeds...	13	7	0
Total	134	51	43

In a state of nature the long- and short-styled forms would no doubt occur in equal numbers, as I infer from the analogy of other dimorphic species of *Primula*, and from having raised the two forms of the present species in exactly the same number from flowers which had been *legitimately* crossed. The preponderance in the above Table of the long-styled form over the short-styled (in the proportion of 134 to 51) results from gardeners generally collecting seed from self-fertilized flowers; and I have shown in my previous paper that the long-styled form spontaneously produces much more seed than the short-styled, owing to the anthers in the long-styled form being placed low down in the corolla, so that, when the flowers fall off, the anthers are dragged over the stigma; and we now also know that long-styled plants, when self-fertilized, almost invariably reproduce long-styled offspring.

To return to the equal-styled variety. Mr. Horwood raised from purchased seed four plants, which certainly were not long-

styled, but were either short- or equal-styled, probably the latter. These four plants were kept separate and allowed to fertilize themselves; from their seed the seventeen plants in the Table were raised, which proved all equal-styled. The stamens stood low down in the corolla as in the long-styled form; and the stigmas, which were globular and smooth, were either completely surrounded by the anthers or stood close above them. My son, Mr. W. E. Darwin, made magnified drawings for me, by the aid of the camera lucida, of the pollen of one of the above equal-styled plants; and, in accordance with the position of the stamens, the pollen resembled in the small size of the grains that of the long-styled form. My son also examined pollen from two equal-styled plants which he procured at Southampton; and in both of these the grains differed extremely in size, a large number being small and shrivelled, whilst many were fully as large as those of the short-styled form and rather more globular. It is possible, or even probable, that the increased size of the grains in these plants was due, not to their having assumed the character of the short-styled form, but to monstrosity; for Max Wichura observed pollen-grains of monstrous size in certain hybrids. The vast number of the small and shrivelled grains in the above two cases explains the fact that though equal-styled plants are generally fertile in a high degree, yet some yield few seeds. From the mutual position of the stigma and anthers in the above seventeen plants they could hardly fail to fertilize themselves; and accordingly four of them spontaneously yielded no less than 180 capsules; of these the gardener selected eight fine capsules for sowing; and they included on an average 54·8 seeds, with a maximum of seventy-two. He gave me thirty other capsules, not selected, of which twenty-seven contained good seeds, averaging 35·5 seeds, with a maximum of seventy; but if six poor capsules, each with less than thirteen seeds, be excluded, the average rises to 42·5. These are higher numbers than could be expected from either ordinary form when self-fertilized, and accord with the view that the male organs belong to one form, and the female organs partially to the other form; so that a self-union with the equal-styled variety is in fact a legitimate union.

Seed was saved from the above seventeen self-fertilized equal-styled plants, and produced sixteen plants, which all proved equal-styled, and resembled their parents in all the before-specified respects. The stamens, however, in one plant were seated higher up in the tube of the corolla than in the true long-styled form;

in another plant almost all the anthers were contabescent. These sixteen plants were the grandchildren of the four original plants, which probably were equal-styled; so that this abnormal condition has been faithfully transmitted, probably, through three, and certainly through two generations. The fertility of one of these grandchildren was carefully observed: six flowers were fertilized with pollen from the same flower, and produced six capsules, containing on an average sixty-eight seeds, with a maximum of eighty-two and a minimum of forty. Thirteen capsules spontaneously self-fertilized yielded an average of 53·2 seeds, with the astonishing maximum in one capsule of ninety-seven seeds, and a minimum of fourteen, which latter capsule might fairly have been excluded, and then the average would have been higher. In no legitimate union has so high an average as sixty-eight seeds been observed by me, or nearly such high maxima as eighty-two and ninety-seven. Hence these plants not only have lost their proper dimorphic structure and peculiar functional powers, but have acquired an abnormal grade of fertility—unless, indeed, their high fertility may be accounted for by the stigmas receiving pollen from the circumjacent anthers at exactly the most favourable period.

With respect to Mr. Duck's lot in the Table, seed was saved from a single plant, of which the form was not observed, and this produced nine equal-styled and twenty long-styled plants. The equal-styled resembled in all respects those previously described; and eight of their capsules spontaneously self-fertilized contained on an average 44·4 seeds, with a maximum of sixty-one and a minimum of twenty-three. In regard to the twenty long-styled plants, the pistil in some of the flowers did not project quite so high as in the ordinary long-styled form; and the stigmas, though properly elongated, were smooth; so that we have a slight approach in structure to the pistil of the short-styled form. So it also is in function; for one of these plants produced no less than fifteen spontaneously self-fertilized capsules, and eight of these contained on an average 31·7 seeds, with a maximum of sixty-one. This average would be rather low for a long-styled plant artificially fertilized with its own pollen, but is high for one spontaneously self-fertilized. For instance, thirty-four capsules produced by the illegitimate grandchildren of a long-styled plant, spontaneously self-fertilized, contained on an average only 9·1 seeds, with a maximum of forty-six. Some seeds indiscriminately saved by the gardener from the foregoing equal-styled and long-styled plants produced sixteen seedlings (grandchildren of the original single

plant belonging to Mr. Duck), which consisted of fourteen equal-styled and two long-styled plants; and I mention this fact as an additional instance of the transmission of the equal-styled variety.

The third lot in the Table, namely the Baston plants, are the last which need be mentioned. The long- and short-styled plants were descended from a distinct stock from the fifteen equal-styled plants. The latter were derived from a single plant, which the gardener is positive was not long-styled; hence, probably, it was equal-styled. In all these fifteen plants the anthers, occupying the same position as in the long-styled form, closely surrounded the stigma, which in one instance alone was slightly elongated. Notwithstanding this position of the stigma, the flowers, as the gardener assured me, did not yield many seeds; and this difference from the foregoing cases may perhaps have been caused by the pollen being bad, as in some of the Southampton equal-styled plants.

Conclusions with respect to the equal-styled variety of P. sinensis.—That this is a variation, and not a third or distinct form, as in the trimorphic genera *Lythrum* and *Oxalis*, is clear; for we have seen in an illegitimate long-styled plant its first appearance; and in the case of Mr. Duck's seedlings, long-styled plants, only slightly deviating from the normal state, and equal-styled plants were produced from the same self-fertilized parent. The position of the stamens in their proper place low down in the tube of the corolla, together with the small size of the pollen-grains, show, first that the equal-styled variety is a modification of the long-styled form, and secondly that the pistil is the part which varies, as indeed was obvious in many of the plants. This variation is of frequent occurrence, and when it has once appeared is strongly inherited. It would have possessed little interest if is had consisted of a mere change of structure; but this is accompanied by modified fertility. Its occurrence apparently stands in close relation with the illegitimate birth of the affected plant, and is probably due to reversion; but to this point I shall recur at the close of this paper.

Primula Auricula.

Although I made no experiments on the illegitimate offspring of this species, I refer to it for two reasons:—First, because I have observed two equal-styled plants in which the pistil resembled in all respects that of the long-styled form,

whilst the stamens had become elongated as in the short-styled form, so that the stigma was almost surrounded by the anthers. The pollen-grains, however, of the elongated stamens resembled in their small size those of the shorter stamens of the long-styled form. Hence these plants have been rendered equal-styled by the increased length of the stamens, instead of, as with *P. sinensis*, by the diminished length of the pistil. Mr. J. Scott observed five other plants in the same state, and he shows * that one of them, when self-fertilized, yielded more seed than an ordinary long- or short-styled form would have done when similarly fertilized, but that it was far inferior in fertility to either form when legitimately crossed. Hence it appears that the male and female organs in this equal-styled variety were in a deteriorated condition, but had been modified in some special manner so as mutually to act on each other more efficiently than in the case of either of the ordinary forms.

The second point which deserves notice is that florists always throw away the long-styled plants, and save seed exclusively from the short-styled form. Nevertheless, as Mr. Scott was informed by a man who raises this species extensively in Scotland, about one-fourth of the seedlings appear long-styled; so that the short-styled form of the Auricula, when fertilized by its own pollen, does not reproduce the same form in so large a proportion as in the case of *P. sinensis*. We may further infer that the short-styled form is not rendered quite sterile by a long course of fertilization with pollen of the same form; but as there would always be some liability to an occasional cross with the other form, we cannot tell how long self-fertilization has been continued. It is possible that our cultivated plants may be much more sterile than those in a state of nature; for Gallesio† speaks with surprise of the exuberant fertility in Italy of the Auricula when it is crossed.

PRIMULA VULGARIS, Brit. Fl.

Var. *acaulis* of Linn. and *P. acaulis* of Jacq.

Before giving my observations on the illegitimate offspring of the Primrose, it will be convenient to show, under the form of a Table, the degree of fertility in this species of the two illegitimate and two legitimate unions; for this has not hitherto been anywhere recorded :—

* Journal Proc. Linn. Soc. viii. (1864) p. 91.
† Teoria della Riproduzione Veg. 1816, p. 67.

Form and union.	Number of flowers fertilized.	Number of good capsules.	Average number of seeds per capsule.	Maximum number of seeds in any one capsule.	Minimum number of seeds in any one capsule.
Long-styled form, fertilized by own-form pollen. Illegitimate union	21	14	52·2	66	30
Long-styled form, fertilized by pollen from short-styled. Legitimate union	12	11	66·9	77	47
Short-styled form, fertilized by own-form pollen. Illegitimate union	18	7	18·8 *	43	5
Short-styled form, fertilized by pollen from long-styled. Legitimate union	8	7	65·0	75	48

* Probably too low an average.

Var. *rubra.*—Mr. Scott states † that this variety, which grew in the Botanic Garden in Edinburgh, was quite sterile when fertilized by pollen from the common Primrose, as well as from a white variety of the same species, but that some of the plants, when artificially fertilized with their own pollen, yielded a moderate supply of seed. He was so kind as to send me some of the self-fertilized seed, from which I raised the plants immediately to be described. I may premise that my experiments on the seedlings, made on a large scale, do not accord in the result with those made by Mr. Scott on the parent plant.

First, in regard to the transmission of form and colour. The parent plant was long-styled, and of a rich purple colour. From the self-fertilized seed 23 plants were raised; of these 18 were purple, of different shades, with 2 of them a little streaked and freckled with yellow, thus showing a tendency to reversion; and 5 were yellow, but generally with a brighter orange centre than in the wild flower. All the plants were profuse flowerers. All were long-styled; but the pistil varied a good deal in length even on the same plant, being rather shorter, or considerably longer, than in the normal long-styled form; and the stigmas likewise varied in shape. Hence it is probable that an equal-styled variety of the primrose would be found by careful search; and I have received two accounts of plants apparently in this condition. The stamens

† Proc. Linn. Soc. viii. (1864) p. 98.

in the seedlings always occupied their proper position low down in the corolla; and the pollen-grains were of the small size proper to the long-styled form, but were mingled with many minute and shrivelled grains. The yellow-flowered and the purple-flowered plants of this first generation were fertilized under a net by their own pollen, and the seed separately sown. From the former, 22 plants were raised, and all were yellow and long-styled. From the latter or the purple-flowered plants, 24 long-styled plants were raised, of which 17 were purple and 7 yellow. In this last case we have an instance of reversion in colour, without the possibility of any cross, to a great-grandparent or to a more distant ancestor if the parent of the Edinburgh plant was not yellow. Altogether, 23 plants in the first generation, and 46 in the second generation, were raised; and the whole of these 69 illegitimate plants were long-styled.

Eight purple-flowered and two yellow-flowered plants of the first illegitimate generation were fertilized in various ways by their own pollen and by that of the common Primrose; and the seeds were separately counted, but I could detect no difference in the fertility of the purple and yellow varieties. Hence, in the Table on the following page, the results are run together.

If we compare the figures in this Table with those previously given, showing the normal fertility of the common Primrose, we shall see that the illegitimate purple- and yellow-flowered varieties are very sterile. For instance, 72 flowers were fertilized with pollen from the same plants and produced only 11 good capsules; but by the standard they ought to have produced 48 capsules; and each of these ought to have contained on an average 52·2 seeds, instead of only 11·5 seeds. When these plants were illegitimately and legitimately fertilized by pollen from the common Primrose, the average numbers were increased, but were far from attaining the normal standards. So it was when both forms of the common Primrose were fertilized by pollen from the illegitimate varieties; and this shows that their male as well as their female organs are in a deteriorated condition. The sterility of these plants was shown in another way, namely, by their not producing any capsules when the access of all insects (except such minute ones as Thrips) was prevented; for under these circumstances the common long-styled Primrose produces a considerable number of capsules. Hence there can be no doubt that the fertility of these plants is greatly impaired. The loss is not correlated with the colour of the flower; and it was to ascertain this point that I made

so many experiments. As the parent plant growing in Edinburgh was found by Mr. Scott to be in a high degree sterile, it may have transmitted the same tendency to its offspring, independently of

Nature of plant experimented on, and kind of union.	Number of flowers fertilized.	Number of good capsules.	Average number of seeds per capsule.	Maximum number of seeds in any one capsule.	Minimum number of seeds in any one capsule.
Purple- and yellow-flowered illegitimate long-styled plants, *illegitimately* fertilized by pollen from the same plant	72	11	11·5	26	5
Purple- and yellow-flowered illegitimate long-styled plants, *illegitimately* fertilized by pollen from the common long-styled primrose	72	39	31·4	62	3
Or, if the ten poorest capsules, including less than 15 seeds, be rejected, we get	72	29	40·6	62	18
Purple- and yellow-flowered illegitimate long-styled plants, *legitimately* fertilized by pollen from the common short-styled Primrose	26	18	36·4	60	9
Or, if the two poorest capsules, including less than 15 seeds, be rejected, we get	26	16	41·2	60	15
The long-styled form of common Primrose, *illegitimately* fertilized by pollen from the long-styled illegitimate purple- and yellow-flowered plants	20	14	15·4	46	1
Or, if the three poorest capsules be rejected, we get	20	11	18·9	46	8
The short-styled form of common Primrose, *legitimately* fertilized by pollen from the long-styled illegitimate purple- and yellow-flowered plants	10	6	30·5	61	6

their illegitimate birth. I am, however, inclined to attribute some weight to the illegitimacy of their descent, both from the analogy of other cases, and more especially from the fact that when the plants were *legitimately* fertilized by pollen of the common Primrose they yielded an average, as may be seen in the Table, of only five more seeds than when *illegitimately* fertilized by the same pollen. Now we know that it is eminently characteristic of the

illegitimate offspring of *Primula sinensis* that they yield but few more seeds when legitimately fertilized than when fertilized by their own-form pollen.

PRIMULA VERIS, Brit. Fl.

Var. *officinalis* of Linn., *P. officinalis* of Jacq.

Seeds from the short-styled form of the Cowslip fertilized by the same-form pollen germinate so badly that I raised from three successive sowings only fourteen plants, which consisted of nine short-styled and five long-styled plants. Hence the short-styled form of the cowslip, when self-fertilized, does not transmit the same form nearly so truly as does that of *P. sinensis*. From the long-styled form, fertilized by its own-form pollen, I first raised three long-styled plants, and from their self-fertilized seed 53 long-styled grandchildren, from their seed 4 long-styled great-grandchildren, and again from their seed 20 long-styled great-great-grandchildren. From two other long-styled plants, fertilized by their own-form pollen, 72 plants were raised, which consisted of 68 long-styled and 4 short-styled. As in this latter case the two parent plants, whilst under the net, did not produce a sufficiency of pollen, I committed, through forgetfulness, a capital error, and took some pollen from an adjoining uncovered long-styled plant. Now I have found on the proboscis of humble-bees of two species and of a moth (Cucullia), which were caught sucking the flowers of the Cowslip, an abundance of pollen of both forms. Hence, by taking the anthers of the uncovered long-styled plant, which probably had been visited by insects, the flowers under the net might have accidentally received a few grains from the short-styled form. Whether the appearance of the four short-styled plants in this set of seedlings may thus be accounted for I know not; but it is the sole exception which has occurred with me of a long-styled form of any plant, when self-fertilized, failing to produce the same form. Dr. Hildebrand, however, states that, out of 17 plants of *P. sinensis* derived from the self-fertilized long-styled form, three were short-styled. Altogether, in the first lot of seedlings, consisting of four generations, and in the second lot, 152 plants were raised, and all were long-styled with the exception of the just-mentioned four short-styled plants.

From the first seeds sown I raised from a self-fertilized short-styled plant one short-styled and two long-styled plants, and from a self-fertilized long-styled plant three long-styled plants. The fertility of these six illegitimate plants was carefully observed,

But I must here premise that I cannot give any accurate standard of comparison as far as the number of the seeds is concerned; for though I counted the seeds of many legitimate or ordinary plants when fertilized in various ways, the number of seeds varied so greatly during successive seasons that it would obviously have been unfair to take a general average as the standard of comparison for illegitimate unions made during any particular season. Moreover the seeds in the same capsule frequently differ so much in size that it is scarcely possible to decide which ought to be counted as good seed. There remains as a standard of comparison the proportional number of fertilized flowers which produce capsules containing any seed. Some of the above six plants were so excessively sterile during successive seasons, that no doubt could be entertained on the subject.

First, for the one illegitimate short-styled plant. In the course of three seasons 27 flowers were illegitimately fertilized by pollen from the same plant, and they yielded only a single capsule, which contained a rather high number of seeds for a union of this nature, namely, 23 seeds. As a standard of comparison I must add that during the same three seasons 44 flowers borne by legitimate short-styled plants were self-fertilized, and yielded 26 capsules; so that the fact of the 27 flowers on the illegitimate plant having produced only one capsule proves how sterile it was. To show that the conditions of life were favourable, I should here state that numerous plants of this and other species of *Primula* all produced an abundance of capsules whilst growing in the same soil and situation as the present and following plants. The sterility in the above illegitimate short-styled plant depended on both the male and female organs being in a deteriorated condition. This was manifestly the case with the pollen; for many of the anthers were shrivelled or contabescent. Nevertheless some of the anthers contained pollen, with which I succeeded in fertilizing some flowers on the illegitimate long-styled plants immediately to be described. Four flowers on this same short-styled plant were likewise *legitimately* fertilized with pollen from one of the following long-styled plants; but only one capsule was produced, containing 26 seeds; and this is a very low number for a legitimate union.

With respect to the five illegitimate long-styled plants, derived from self-fertilized short-styled and long-styled parents, their fertility was observed during the same three years. These five plants, when self-fertilized, differed considerably from each other

in fertility, as in the case of the illegitimate long-styled plants of *Lythrum Salicaria*; and their fertility varied much according to the season. . I may premise, as a standard of comparison, that during the same years 56 flowers on legitimate or ordinary long-styled plants of the same age, and grown in the same soil, were fertilized with their own pollen, and yielded 27 capsules. On the first of the five illegitimate long-styled plants, 36 flowers were self-fertilized in the course of the three years, but they did not produce a single capsule. Many of the anthers on this plant were contabescent; but some seemed to contain sound pollen: nor were the female organs quite impotent; for I obtained from a *legitimate* cross one capsule with good seed. On the second illegitimate long-styled plant, 44 flowers were fertilized during the same years with their own pollen, but they produced only a single capsule. The third and fourth plants were in a very slight degree more productive. The fifth and last plant was decidedly more fertile; for 42 self-fertilized flowers yielded 11 capsules. Altogether, in the course of the three years, no less than 160 flowers produced by the five illegitimate long-styled plants were fertilized with their own pollen, and yielded only 22 capsules. According to the standard above given, they ought to have produced 80 capsules. These 22 capsules contained on an average 15·1 seeds. I believe, subject to the doubts before specified, that with legitimate plants the average from a union of this nature would have been above 20 seeds. Twenty-four flowers on the same five illegitimate plants were legitimately fertilized by pollen from the above-described illegitimate short-styled plants, and produced only 9 capsules, which is an extremely small number for a legitimate union. These 9 capsules, however, contained an average of 38 apparently good seeds, which is as large a number as legitimate plants sometimes yield. But this high average was almost certainly false; and I mention the case for the sake of showing the difficulty of arriving at a fair result; for this average mainly depended on two capsules containing the extraordinary numbers of 75 and 56 seeds; but these seeds, though I felt bound to count them, were so poor that, judging from trials actually made in other cases, I do not suppose that one would have germinated; and therefore they ought not to have been included. Lastly, 20 flowers were legitimately fertilized by pollen from a legitimate plant, and this increased their fertility; for they produced 10 capsules. Yet this is but a very small proportion for a legitimate union.

Hence there can be no doubt that these five long-styled plants

and the one short-styled illegitimate plant were extremely sterile. Their sterility was shown, as in the case of hybrids, in another way, namely, by their flowering profusely, and especially by the long endurance of the flowers. For instance, I fertilized many flowers on these plants, and fifteen days subsequently (viz. on March 22nd) I fertilized numerous long-styled and short-styled flowers on common Cowslips which grew close by. These latter flowers, on April 8th, were withered, whilst most of the illegitimate flowers remained quite fresh for several days subsequently; so that some of these illegitimate plants, after being fertilized, remained in full bloom for above a month.

I must add a few words on the degree of fertility of the 53 illegitimate long-styled grandchildren, descended from the long-styled plant which was first fertilized with its own pollen. The pollen in two of these grandchildren was examined and found to include a multitude of small and shrivelled grains. Nevertheless these plants were not very sterile; for 25 flowers, fertilized with their own pollen, produced 15 capsules, containing an average of 16·3 seeds. As already stated, the probable average with legitimate plants for a union of this nature is rather above 20 seeds. But it should be observed that these plants were remarkably healthy and vigorous, being placed under highly favourable conditions, and grown in pots in the greenhouse; and we shall hereafter have occasion to show that such treatment greatly increases the fertility of the Cowslip. When these same plants were planted during the next year (which, however, was unfavourable) out of doors, in the same place with all the other plants, 20 self-fertilized flowers produced only 5 capsules, containing extremely few and wretched seeds. Four long-styled great-grandchildren were raised, as previously stated, from the self-fertilized grandchildren: they were kept under the same highly favourable conditions in the greenhouse; and 10 self-fertilized flowers yielded the large proportion of 6 capsules, containing on an average 18·7 seeds. Although, under the circumstances just stated, we cannot compare the fertility of these plants with those of the first generation, grown out of doors, yet we may infer that illegitimate descent during three successive generations did not much, or at all, increase their sterility.

Equal-styled red variety of P. veris.—Mr. Scott has described * a plant of this kind growing in the Botanic Garden of Edinburgh. He states that it was highly self-fertile, although insects were

* Proc. Linn. Soc. vol. viii. (1864) p. 105.

excluded; and he explains this anomalous circumstance by showing, first, that the anthers and stigma are in close apposition, and, secondly, that the stamens with their pollen resemble the stamens of the short-styled form, whilst the pistil resembles that of the long-styled form both in length and in the structure of the stigma. Hence the self-union of this variety is, in fact, a legitimate union, and consequently is highly fertile. Mr. Scott further states that this variety yielded very few seeds when fertilized by either the long- or short-styled common Cowslip, and, again, that both forms of the latter, when fertilized by the equal-styled variety, likewise produced very few seeds. But the experiments with the Cowslip tried by Mr. Scott were few in number; and I suspect that the results were accidental. Anyhow my observations on equal-styled seedlings derived from the Edinburgh plant do not, as we shall see, confirm his results.

I raised 20 plants from self-fertilized seed sent me by Mr. Scott; and they all produced red flowers, varying slightly in tint. Of these, two were strictly long-styled both in structure and in function; for their reproductive powers were tested by crosses with both forms of the common cowslip. Six plants were equal-styled; but on the same plant the pistil varied a good deal in length during different seasons. This was likewise the case, according to Mr. Scott, with the parent plant. Lastly, 12 plants were in appearance short-styled; but they varied much more in the length of their pistils than the ordinary short-styled Cowslip, and they differed widely from the latter in their powers of reproduction. Short-styled Cowslips, when insects are excluded, are extremely barren: for instance, on one occasion six fine plants produced only about 50 seeds (that is, less than the product of two good capsules), and on another occasion not a single capsule. Now, when the above 12 so-called short-styled seedlings were similarly treated, all, except two or three, produced a great abundance of capsules, containing numerous seeds, which germinated remarkably well. Moreover three of these plants, which during the first year were furnished with quite short pistils, on the following year produced pistils of extraordinary length. Hence the greater number of the so-called short-styled plants cannot be distinguished in function from the equal-styled variety, which they likewise partially resemble in structure. The stamens in all these eighteen plants are seated high up in the corolla, as in the true short-styled Cowslip; and the pollen-grains resemble those of the same form in their large size, but are mingled with a few shrivelled grains. In function

this pollen is identical with that of the short-styled Cowslip; for ten long-styled flowers of the common Cowslip were legitimately fertilized by pollen from a true equal-styled variety, and produced six capsules, containing on an average 34·4 seeds; whilst seven capsules on a short-styled Cowslip illegitimately fertilized by the same pollen yielded an average of only 14·5 seeds.

As the eighteen equal-styled and so-called short-styled plants differ from each other in their powers of reproduction, and as this is an important subject, I will give a few details with respect to five of them. First, an equal-styled plant, protected from insects (as in all the following cases, with one stated exception), spontaneously produced numerous capsules, five of which gave an average of 44·8 seeds, with a maximum in one capsule of 57. But six capsules, which had been fertilized by pollen from a short-styled Cowslip (and this is a legitimate union), gave an average of 28·5 seeds, with a maximum of 49; and this is a much lower average than might have been expected. Secondly, nine capsules from an equal-styled plant, which was *not* protected from insects, but probably was self-fertilized, gave an average of 45·2 seeds, with a maximum of 58. Thirdly, a plant which had a very short pistil in 1865, produced spontaneously many capsules, six of which contained an average of 33·9 seeds, with a maximum of 38. In 1866 this same plant had a pistil of wonderful length; for it projected quite above the anthers, and the stigma resembled that of the long-styled form. In this condition it produced spontaneously a vast number of fine capsules, six of which contained almost exactly the same average number as before, viz. 34·3, with a maximum of 38. Four flowers on this plant, legitimately fertilized by pollen from a short-styled cowslip, yielded capsules with an average of 30·2 seeds. Fourthly, a short-styled plant spontaneously produced in 1865 an abundance of capsules, ten of which contained an average of 35·6 seeds, with a maximum of 54. In 1866 it had become in all respects long-styled, and ten capsules gave almost exactly the same average, viz. 35·1 seeds, with a maximum of 47. Eight flowers on this plant, legitimately fertilized by pollen from a short-styled Cowslip, produced six capsules, with the high average of 53 seeds, and the high maximum of 67. Eight flowers were also fertilized by pollen from a long-styled Cowslip (this being an illegitimate union), and produced seven capsules, containing an average of 24·4 seeds, with a maximum of 32. The fifth and last plant remained in the same condition during both years: it had a pistil rather longer than that of the true short-styled form,

with the stigma smooth, as it ought to be in this form, but abnormal in shape, like a much-elongated inverted cone. It produced spontaneously many capsules, five of which, in 1865, gave an average of only 15·6 seeds; and in 1866 ten capsules still gave an average only a little higher, viz. of 22·1, with a maximum of 30. Sixteen flowers were fertilized by pollen from a long-styled Cowslip, and produced 12 capsules, with an average of 24·9 seeds and a maximum of 42. Eight flowers were fertilized by pollen from a short-styled Cowslip, but yielded only two capsules, containing 18 and 23 seeds. Hence this plant, in function and partially in structure, is in an almost exactly intermediate state between the long-styled and short-styled form, but inclining towards the short-styled; and this accounts for the low average of seeds which it produced when spontaneously self-fertilized.

We thus see that the foregoing five plants differ much from each other in fertility. In two individuals a great difference in the length of the pistil during two succeeding years made no difference in the number of seeds produced. As all five plants possessed the male organs of the short-styled form in a perfect state, and the female organs of the long-styled form in a more or less complete state, they spontaneously produced a surprising number of capsules, which generally contained a large average of remarkably good seeds. With ordinary Cowslips, legitimately fertilized, I once obtained from plants cultivated in the greenhouse the high average, from seven capsules, of 58·7 seeds, with a maximum in one capsule of 87 seeds; but from plants grown out of doors I never obtained a higher average than 41 seeds. Now two of the equal-styled plants, grown out of doors and spontaneously self-fertilized, gave averages of 44 and 45 seeds; but this high fertility may perhaps be attributed to the stigma receiving pollen from the surrounding anthers at exactly the right period. Two of these plants, fertilized by pollen from the long-styled cowslip (and this in fact is a legitimate union), gave a lower average than when self-fertilized. On the other hand, one plant, when similarly fertilized by the Cowslip, yielded the unusually high average of 53 seeds, with a maximum of 67. Lastly, as we have just seen, one of these plants was in an almost exactly intermediate condition in its female organs between the long- and short-styled forms, and consequently, when self-fertilized, yielded a low average of seed. If we add together all the experiments which I made on the equal-styled plants, 41 spontaneously self-fertilized capsules (insects having been excluded) gave an average of 34 seeds, which is exactly the same

number as the parent plant yielded in Edinburgh. Thirty-four flowers, fertilized with pollen from the long-styled Cowslip (and this is an analogous union), produced 17 capsules, containing an average of 33·8 seeds. It is a rather singular circumstance, for which I cannot account, that 20 flowers, artificially fertilized with pollen from the same plants, yielded only ten capsules, containing the low average of 26·7 seeds.

As bearing on inheritance, it may be added that 72 seedlings were raised from one of the red-flowered strictly equal-styled self-fertilized plants derived from the Edinburgh plant which was similarly characterized. These 72 grandchildren all bore, as in the first generation, red flowers, with the exception of one plant, which reverted in colour to the common Cowslip. In regard to structure, nine plants were truly long-styled, and had their stamens seated low down in the corolla in the proper position; the remaining 63 plants were equal-styled, though the stigma in about a dozen of them stood a little below the anthers. We thus see that the anomalous combination in the same plant, of male and female sexual organs which properly exist in distinct forms or plants, is inherited with much force. Thirty-six seedlings were also raised from long- and short-styled common Cowslips, crossed by pollen of the equal-styled variety. Of these plants one alone was equal-styled, 20 were short-styled but with the pistil in three of them rather too long, and the remaining 15 were long-styled. In this case we have an illustration of the difference between simple inheritance and prepotency of transmission; for the equal-styled variety, when self-fertilized, transmits its character, as we have seen, with much force, but when crossed with the common Cowslip cannot withstand the greater power of transmission of the latter.

Genus PULMONARIA.

I have little to say on this genus. I obtained some seeds of *P. officinalis* from a garden where the long-styled form alone grew, and raised eleven seedlings, which were all long-styled. These plants were named for me by Dr. Hooker; but I have some doubts whether they belong to the same species as that described under the same name by Dr. Hildebrand*; for he found the long-styled form absolutely sterile with its own pollen, whilst my long-styled seedlings and the parent plants when self-fertilized yielded a fair supply of seed. It is, however, possible that these plants may have varied in function, as in the case of the so-called short-

* Bot. Zeitung, 1865, p. 13.

styled individuals belonging to the equal-styled variety of *Primula veris*, and thus have become self-fertile. The long-styled form of *Pulmonaria angustifolia* is, like Dr. Hildebrand's plant, absolutely sterile with its own pollen, so that I could never procure a single seed. On the other hand, the short-styled form, differently from that of *P. officinalis*, is fertile with its own pollen in a quite remarkable degree for a dimorphic plant. From seeds carefully self-fertilized I raised 18 plants, of which 13 proved to be short-styled and 5 long-styled. I did not observe their power of producing seed; but this, from the fertility of the first union, probably would have been nearly perfect.

Conclusions in regard to the Illegitimate Offspring of Trimorphic and Dimorphic Plants.

It is remarkable in how many points and how closely illegitimate unions between the two or three forms of the same species, together with their illegitimate offspring, resemble hybrid unions between distinct species together with their hybrid offspring. In both cases we meet with every degree of sterility, from very slightly lessened fertility to absolute barrenness, when not even a single seed-capsule is produced. In both cases the facility of effecting the first union is much influenced by the conditions to which the plants are exposed *. Both with hybrids and illegitimate plants the innate degree of sterility is highly variable in plants raised from the same mother plant. In both cases the male organs are more plainly affected than the female; and we often find contabescent anthers enclosing shrivelled and utterly powerless pollen-grains. The more sterile hybrids, as Max Wichura has well shown, are sometimes much dwarfed in stature, and have so weak a constitution that they are liable to premature death; and we have seen exactly parallel cases with the illegitimate seedlings of *Lythrum* and *Primula*. Many hybrids are the most persistent and profuse flowerers, as are some illegitimate plants. When a hybrid is crossed by either pure parent form, it is notoriously much more fertile than when crossed *inter se* or by another hybrid; so when an illegitimate plant is fertilized by a legitimate plant, it is more fertile than when fertilized *inter se* or by another illegitimate plant. When two species are crossed and they produce numerous

* This has been remarked by many experimentalists in effecting crosses between distinct species; and in regard to illegitimate unions I have given a striking illustration in the case of *Primula veris* in a foot-note to my paper on *Lythrum*, in Proc. Linn. Soc. vol. viii. (1864) p. 180.

seeds, we expect as a general rule that their hybrid offspring will be moderately fertile; but if the parent plants produce extremely few seeds, we expect that the hybrids will be very sterile. But there are marked exceptions, as shown by Gärtner, to this rule. So it is with illegitimate unions and illegitimate offspring: thus the mid-styled form of *Lythrum Salicaria*, when illegitimately fertilized by pollen from the longer stamens of the short-styled form, produced an unusual number of seeds; and their illegitimate offspring were not at all, or hardly at all, sterile. On the other hand, the illegitimate offspring from the long-styled form, fertilized by pollen from the same form, yielded few seeds, and the illegitimate offspring thus produced were very sterile; but they were more sterile than might have been expected relatively to the difficulty of effecting the union of the parent sexual elements. No point is more remarkable in regard to the crossing of species than their unequal reciprocity. Thus species A will fertilize B with the greatest ease; but B will not fertilize A after hundreds of trials. We have exactly the same case with illegitimate unions; for the mid-styled *Lythrum salicaria* was easily fertilized by illegitimate pollen from the longer stamens of the short-styled form, and yielded many seeds; but the latter form did not yield a single seed when fertilized by the longer stamens of the mid-styled form.

Another important point is prepotency. Gärtner has shown that when two species are fertilized with each other's pollen, if they be afterwards fertilized with their own pollen, or with that of the same species, this is so prepotent over the foreign pollen that the effect of the latter, though placed on the stigma some time previously, is entirely destroyed. Exactly the same thing occurs with illegitimate unions, as I ascertained in the following manner: I fertilized illegitimately a long-styled common Cowslip with pollen from the same form, and exactly twenty-four hours afterwards I fertilized the same stigmas legitimately with pollen from a short-styled dark-red Polyanthus. I should state that I raised many seedlings from crossed Cowslips and the Polyanthus, and know their peculiar appearance. I further know by the test of the fertility of the mongrels, as well *inter se* as with both parent forms, that the Polyanthus is a variety of the Cowslip, and not of the Primrose (*P. vulgaris*) as some authors have supposed. Now from the long-styled Cowslip, fertilized in the manner just described, I raised thirty seedlings, every one of which had flowers coloured more or less red, so that the legitimate Polyanthus-pollen wholly obliterated the influence of the illegitimate Cowslip-pollen

which had been placed on the stigmas twenty-four hours previously, and not a single pure Cowslip was produced. We thus see that there is the closest agreement in all the above-specified and most characteristic points between hybrid unions with their hybrid offspring and illegitimate unions with their illegitimate offspring.

The parallelism in the two following relations is not so clear, but apparently holds good. We know that when dimorphic and trimorphic plants are legitimately fertilized the seedlings consist in about equal numbers of the two or three proper forms. But we have seen that when the long-styled *Lythrum* was illegitimately fertilized by its own-form pollen, all the offspring, fifty-six in number, were long-styled; so it was with the fifty-two illegitimate children and grand-children of the long-styled *Primula sinensis*; with the sixty-nine of *P. vulgaris*, and, with the exception of four short-styled plants, with the 152 illegitimate children, grandchildren, great-grandchildren, and great-great-grandchildren of *P. veris*. The exceptional case of the four short-styled plants may perhaps be accounted for by an error, as previously explained, in the method of fertilization. Lastly, from the self-fertilized long-styled *Pulmonaria officinalis* eleven seedlings were raised, and these were all long-styled. Dr. Hildebrand has recorded an analogous case with the long-styled form of *Oxalis rosea*. With respect to the short-styled form, when plants of this nature are illegitimately fertilized by their own-form pollen, short-styled offspring are generally produced in unnaturally large proportion *. In two instances when one form of the *Lythrum* was illegitimately fertilized, not by its own-form pollen, but by that of another form, the offspring (thirty-seven in number) belonged to the two parent forms, but not one to the third form, as would have occurred with a legitimate union. From a third illegitimate union between the forms of *Lythrum* the offspring (forty in number) consisted of all three forms in rather unequal proportions; but this union was much less sterile than any other illegitimate union. From these various facts it is manifest that an illegitimate union seriously disturbs the natural and proper proportional numbers of the two or three sexual forms. Now if we turn to hybrid unions between species which have their

* Since this paper was read before the Society, I have raised illegitimate seedlings from both the long-styled and short-styled forms of *Polygonum Fagopyrum* or common Buckwheat. As yet only 49 seedlings from the self-fertilized long-styled form have flowered, and of these 45 are long-styled and four short-styled; so that the rule does not here hold quite so strictly as in the cases given in the text. Of the 33 seedlings from the self-fertilized short-styled form, 19 are short-styled and 14 are long-styled.

sexes separated, we find something of the same kind; for Max Wichura * has shown that with hybrid willows the proportion between the male and female plants is very different from what it is with the pure parent species. Naudin † has also observed in the case of hybrid *Luffa* that the racemes, which ought to bear male flowers alone, included both sexes, and that some plants had become female by the complete disappearance of the male flowers. With hybrid animals the just proportion of the two sexes is likewise disturbed, the males being in excess ‡. Hence hybridism, like illegitimacy of birth, certainly appears to affect the sex of the offspring.

It is manifest, from the facts previously given, that there is a strong tendency in *Primula sinensis*, *veris*, *Auricula*, and *vulgaris* to produce equal-styled varieties. This singular variation may be compared with those cases of monstrous hermaphroditism which occasionally occur both in the animal and vegetable kingdoms; for as with unisexual organisms the opposite sexes are sometimes combined in the same individual in a more or less perfect manner, so here the opposite or reciprocal sexual forms are combined in the same plant and flower. In *Primula sinensis*, *vulgaris*, and *veris* it is the female organ or pistil which varies; for the pistil in the first two species is properly long-styled, and in the latter species properly short styled; whilst in the long-styled *P. Auricula* it is the male organs or stamens which vary. Illegitimate birth seems to be one chief exciting cause of this variation; for I observed its first appearance and various stages in illegitimate plants of *P. sinensis*; and we know that it frequently occurs in *P. Auricula*, which is generally propagated in an illegitimate manner. Simple cultivation, however, suffices to cause it; for I observed one incipient case in a long-styled *P. veris* which had been removed from the fields and cultivated in good soil; and I have heard of instances in cultivated long-styled plants of *P. vulgaris*. When this variation

* Die Bastardbefruchtung im Pflanzenreich, 1865, p. 43.

† Nouvelles Archives du Muséum, tom. i. p. 113.

‡ This was first observed by Buffon, and has since been confirmed, but perhaps hardly by sufficient facts, by Flourens in his 'Longévité Humaine,' 1855, p. 154. Dr. O. Staudinger, of Dresden, has recently informed me that he has never seen, in the case of Lepidoptera, a single hybrid of the female sex. He has either bred or obtained above sixty hybrids between *Smerinthus ocellata* ♂ and *populi* ♀; and all these are males except two, which are partially hermaphrodites. This latter circumstance deserves notice in reference to the subject discussed in the following paragraph of the text, namely, on the tendency in illegitimate plants to combine both sexual forms in the same plant; for this may be considered a kind of hermaphroditism.

has once appeared, it is inherited with remarkable force. Plants which have become equal-styled, and have thus lost their dimorphic structure, are perfectly self-fertile, being quite as fertile as ordinary plants when legitimately crossed. This being the case, and as the variation so often arises, it may be asked why has it not occurred under nature and been naturally selected or preserved. The answer, no doubt, is that such plants would be eminently liable to long-continued self-fertilization, which certainly entails a weak constitution *.

As the great majority of plants of all kinds and even some species of *Primula* † are non-dimorphic, the loss of dimorphism in the equal-styled varieties may be attributed, as Mr. Scott has remarked, to reversion to the primordial condition of the plant; and this explains the force with which this modification is inherited. We have also seen in illegitimate plants descended from the long-styled *P. sinensis* that which appears to be another case of reversion, namely, the small size and wild aspect of their flowers. Now I have elsewhere ‡ given abundant evidence showing that the offspring of crossed species and varieties are eminently liable to reversion. Hence in the cases in which illegitimate birth appears to have been the exciting cause of reversion, illegitimacy has acted like hybridization. The parallelism in this particular instance is close; in a future paper I shall show that the *common Oxlip* is a hybrid between *P. veris* and *vulgaris*; and I have seen short-styled wild Oxlips which had become strictly equal-styled, and others which exhibited gradations in the length of the pistil, but not in the roughness of the stigma, leading to this same state, like the gradations described under *P. sinensis* and *veris*.

Although there may be some doubt with respect to the parallelism between illegitimate unions with their illegitimate offspring and hybrid unions with their hybrid offspring, in regard to the last two subjects discussed, namely, the disturbed proportions of the sexual forms and sexes, and the appearance through reversion of equal-styled varieties, there can be no doubt that the parallelism is so close as to amount almost to identity in the following chief characteristic points, namely:—the various grades of lessened fertility up to complete barrenness—the fertility innately differ-

* See my work on the 'Variation of Animals and Plants under Domestication,' 1868, vol. ii. chap. xvii., and especially p. 128.

† Mr. J. Scott, "on the Reproductive Organs in the Primulaceæ," Proc. Linn. Soc. Bot. vol. viii. (1864) p. 78.

‡ Variation of Animals and Plants under Domestication, vol. ii. chap. xiii.

ing in seedlings of the same parentage, and being much affected by the nature of the conditions; the more sterile plants being dwarfed in stature, weakly in constitution, and liable to premature death; the anthers being often contabescent; the first unions and the offspring being generally sterile in a parallel degree, but with marked exceptions to the rule; the fertility of the offspring being increased by a cross with a legitimate form, or with one of the pure parent forms; the unequal reciprocity in sexual power between the same two forms or between the same two species; and, lastly, the prepotent action of legitimate pollen in the one case, and of the plant's own pollen in the other case. Hence it is hardly an exaggeration to assert that the illegitimate offspring from an illegitimate union are hybrids formed within the limits of one and the same species.

This conclusion is important; for, as I have elsewhere * more fully explained, we thus learn, first, that the lessened fertility of the first union and of the offspring of two forms is no sure criterion of specific distinctness. If any one were to cross two varieties of the same form of *Lythrum* or *Primula* for the sake of ascertaining whether they were specifically distinct, and he found that they and their offspring were extremely sterile, and that they resembled in a whole series of relations crossed species and their hybrid offspring, he would maintain that his varieties had been proved to be good and true species; but he would be completely deceived. In the second place, as the forms of the same trimorphic or dimorphic species are obviously identical, with the exception of the reproductive organs, in general structure, and as they are identical in general constitution (for they live under precisely the same conditions), the sterility of their illegitimate unions, and that of their illegitimate offspring, must depend exclusively on the nature of the sexual elements and on their incompatibility for uniting in a particular manner. And as we have just seen that distinct species when crossed resemble in a whole series of relations the forms of the same species when illegitimately united, we are led to conclude that in this case likewise the sterility depends exclusively on the incompatible nature of their sexual elements, and not on any general difference in constitution or structure. We are, indeed, led to this same conclusion by the impossibility of detecting any difference sufficient to account for certain species crossing with the greatest ease, whilst other closely

* Origin of Species, 4th edit. 1866, p. 323. Variation of Animals &c. under Domestication, 1868, vol. ii. p. 184.

allied species cannot be crossed, or can only be crossed with the greatest difficulty. We are led to this conclusion still more forcibly by considering the great difference which often exists in the facility of crossing reciprocally the same two species; for it is clear in this case that the result must depend on the nature of the sexual elements, the male element of the one species acting freely on the female element of the other, but not so in the reversed direction. And now we see that this same conclusion is independently and strongly fortified by considering the illegitimate unions and offspring of trimorphic and dimorphic plants. In so complex and obscure a subject as hybridism it is no slight gain to arrive at a definite conclusion, namely, that we must look exclusively to a functional difference in the sexual elements, as the cause of the sterility of species when first crossed, and of their hybrid offspring. It was this consideration which led me to make so many and such laborious observations as have been recorded in this paper, and which justify, I think, their publication.

On the Specific Difference between *Primula veris*, Brit. Fl. (var. *officinalis* of Linn.), *P. vulgaris*, Brit. Fl. (var. *acaulis*, Linn.), and *P. elatior*, Jacq.; and on the Hybrid Nature of the common Oxlip. With Supplementary Remarks on naturally-produced Hybrids in the genus *Verbascum*. By CHARLES DARWIN, M.A., F.R.S., F.L.S., &c.

[Read March 19, 1868.]

THE claim of the above three forms (namely, the common Cowslip, Primrose, and Bardfield Oxlip) to be ranked as distinct species has been discussed at greater length than that of almost any other plants. Linnæus considered them varieties, as do some of the most distinguished botanists at the present day; whilst others who have carefully studied these plants do not doubt that they deserve to be ranked as distinct species. The following observations show, I think, that the latter view is correct; and they further show that the common Oxlip, which is found in most parts of England, is a hybrid between *P. veris* and *vulgaris*.

The Cowslip differs so conspicuously in general appearance from the Primrose, that nothing need here be said with respect to their external characters *. But some less-obvious differences de-

* The Rev. W. A. Leighton has pointed out certain differences in the form of the capsules and seed, in 'Ann. & Mag. of Nat. Hist.' 2nd series, vol. ii. (1848), p. 164.

serve notice. As both species are dimorphic, their complete fertilization depends on insects. They emit a different odour. The Cowslip is habitually visited during the day by humblebees (viz. *Bombus muscorum* and *hortorum*, and perhaps by other species) and at night by moths, as I have seen with the *Cucullia*. The Primrose is never visited (and I speak after many years' observation) by the larger humblebees, and only rarely by smaller kinds; hence its fertilization depends almost exclusively on moths. Consequently the nectar in these two plants must differ much; for there is nothing in the structure of the flowers which can determine the visits of different insects. The utmost difference in the colour of the corolla does not in the least prevent, as I have often observed, a bee from recognizing the varieties of any species which it may at the time be visiting. The Primrose, when legitimately fertilized, produces on an average many more seeds than the Cowslip, namely, in about the proportion of 100 to 55. It is a more important distinction that both the long-styled and short-styled forms of the Primrose, when illegitimately fertilized with their own pollen, are much more fertile than the corresponding forms of the Cowslip when similarly treated. When long-styled plants of the Cowslip are protected by a net, so that they cannot be visited by insects, they yield no seed, as I found to be the case with no less than eighteen plants; and the short-styled form is only a little less sterile. The long-styled Primrose, on the other hand, when similarly protected, produces a considerable number of capsules, of which twenty-three contained on an average 19·2 seeds: the short-styled form produces under these circumstances fewer capsules, of which fourteen contained on an average only 6·2 seeds. This great difference in the fertility of the Cowslip and Primrose when all insects which are capable of exclusion are excluded, depends in part on the Primrose being innately much more self-fertile than the Cowslip, and in part on the former being much frequented by Thrips, which, dusted with pollen, may often be seen crawling within the flowers.

The Primrose, as everyone knows, flowers a little earlier in the spring than the Cowslip, and inhabits slightly different stations and districts. The Primrose generally grows on banks or in woods, whilst the Cowslip is found in more open places. The geographical range of the two forms is different. Dr. Bromfield remarks * that "the primrose is absent from all the interior region of northern Europe, where the cowslip is indigenous." In Norway,

* Phytologist, vol. iii. p. 694.

however, both plants range to the same degree of northern latitude*.

The Cowslip and Primrose, when reciprocally crossed, are far from fertile. Gärtner † crossed 27 flowers of *P. vulgaris* with pollen of *P. veris*, and obtained 16 capsules; but these did not contain any good seed. He also crossed 21 flowers of *P. veris* with pollen of *P. vulgaris*; and now he got only 5 capsules, containing seed in a still less perfect condition. Gärtner knew nothing about dimorphism; and his complete failure may perhaps be accounted for by his having crossed together the same form of the Cowslip and Primrose; for this would have been an illegitimate as well as a hybrid union, and would consequently have been sterile in the highest degree. I was rather more fortunate in my trials: I crossed legitimately three flowers on the long-styled and three on the short-styled Cowslip, with pollen from the opposite form of the Primrose, and obtained one capsule containing the large number of 48 apparently good seeds. I crossed on the same plant six flowers illegitimately, with pollen from the corresponding form of the Primrose, and obtained three capsules, containing seeds so poor that there was no chance of thier germination. I likewise fertilized 12 flowers of the Primrose, consisting of both forms, with pollen from both forms of the Cowslip, and 18 flowers in the same manner with pollen of the Polyanthus. I should here state that the Polyanthus is a variety of the Cowslip, as I infer from their mongrel offspring being perfectly fertile *inter se*; and as there seems to be no essential difference ‡ in the action of Cowslip- and Polyanthus-pollen on the Primrose, the results are here run together. Eight long-styled and seven short-

* H. Lecoq, 'Géograph. Bot. de l'Europe,' tom. viii. (1858) pp. 141, 144. See also Ann. & Mag. of Nat. Hist. ix. (1842) pp. 156, 515. Also Boreau, 'Flore du centre de la France,' 1840, tom. ii. p. 376. With respect to the rarity of *P. veris* in western Scotland, see H. C. Watson, 'Cybele Britannica,' ii. p. 293.

† Bastarderzeugung, 1849, p. 721.

‡ Mr. Scott has discussed this subject (Proc. Linn. Soc. viii. Bot. (1864) p. 103) and has arrived at a different conclusion; but I do not think sufficient experiments were tried to justify his conclusions. The results of sterile crosses are always liable to much fluctuation. Pollen from the Cowslip at first appears rather more efficient on the Primrose than that of the Polyanthus; for 12 flowers of both forms of the Primrose, fertilized legitimately and illegitimately by the Cowslip, gave 5 capsules, containing 32·4 seeds; whilst 18 flowers similarly fertilized by Polyanthus-pollen yielded only 5 capsules, containing only 22·6 seeds. On the other hand, the seed produced by the Polyanthus-pollen was much the finest of the whole lot.

styled flowers of the Primrose were *legitimately* crossed with pollen of the Cowslip and Polyanthus, and, together, they yielded six capsules, containing on an average 37 seeds, some of fine quality and some only moderately good. The pure Primrose, when legitimately fertilized by pollen from the Primrose, yields an average of almost exactly double this number of seeds, viz. 71. Lastly, eight long-styled and seven short-styled flowers of the Primrose were *illegitimately* fertilized by pollen of the Cowslip and Polyanthus, and, together, they yielded only four capsules, containing on an average only 13 seeds, some good and some poor. The Primrose, when *illegitimately* fertilized by pollen from the Primrose, yields an average of about 44 seeds. We thus see that a cross between the same forms of the Primrose and Cowslip is far more sterile than a cross between the opposite forms. The Primrose, especially the short-styled form, when fertilized by the Cowslip, is less sterile, as Gärtner likewise observed, than the Cowslip when reciprocally fertilized by the Primrose.

I sowed the seeds produced from the several foregoing crosses; but none germinated except those from the short-styled Primrose fertilized by the pollen of the Polyanthus; and these seeds were the finest of the whole lot. I thus raised six plants, and compared them with a group of wild Oxlips, evidently produced from the same capsule, which I had transplanted into my garden. One of these wild Oxlips produced slightly larger flowers than the others, and this one was identical in every character (in foliage, flower-peduncle, and flowers) with my six plants, excepting that the flowers in the latter were tinged of a dirty red colour.

We have now seen that the Cowslip and Primrose cannot be crossed either way except with considerable difficulty, that they differ conspicuously in external appearance, that they differ in certain curious physiological characters, that they inhabit slightly different stations and range differently. Hence those botanists who rank these plants as varieties ought to be able to prove that they are not as well fixed in character as are most species; and the evidence in favour of such instability of character does appear at first very strong. It rests, first, on statements made by several competent observers that from seeds of the same plant they have raised Cowslips, Primroses, and Oxlips; and, secondly, on the frequent occurrence in a state of nature of plants presenting every intermediate gradation between the Cowslip and Primrose.

The evidence, however, on the first head is of little value; for, dimorphism not being formerly understood, the seed-bearing plants were in no instance * protected from the visits of insects; and there would be almost as much risk of an isolated Cowslip, or of several Cowslips if consisting of the same form, being crossed by a neighbouring Primrose and producing Oxlips, as of one sex of a diœcious plant, under similar circumstances, being crossed by the opposite sex of an allied and neighbouring species. Mr. H. C. Watson, a critical and most careful observer, made many experiments by sowing the seeds of Cowslips and of various kinds of Oxlips, and arrived at the following conclusion †, namely, "that seeds of a Cowslip can produce Cowslips and Oxlips, and that seeds of an Oxlip can produce Cowslips, Oxlips, and Primroses." This conclusion harmonizes perfectly with the view that in all cases, when such results have been obtained, the unprotected Cowslips have been crossed by Primroses, and the unprotected Oxlips by either Cowslips or Primroses; for in this latter case we might expect, by the aid of reversion, which notoriously comes into powerful action with hybrids, that both parent forms in appearence pure, as well as many intermediate gradations, would be produced. Nevertheless the two following statements offer considerable difficulty. The Rev. Prof. Henslow ‡ raised from seed of a Cowslip growing in his garden, various kinds of Oxlips and one perfect Primrose; but a statement in the same paper perhaps throws light on this anomalous result. Prof. Henslow had previously transplanted into his garden a Cowslip, which completely changed its appearance during the following year, and now resembled an Oxlip. Next year again it changed its character, and produced, in addition to umbels, a few single-flowered scapes, bearing flowers somewhat smaller and more deeply coloured than those of the common Primrose. From what I have myself observed with Oxlips, I cannot doubt that this plant was an Oxlip in a highly variable condition, almost like the famous *Cytisus Adami*. This variable plant was propagated by offsets, which were planted in different parts of the

* One author states in the 'Phytologist' (vol. iii. p. 703) that he covered with bell-glasses the Cowslips, Primroses, &c. on which he experimented. He specifies all the details of his experiment, but does not say that he artificially fertilized his plants; yet he obtained an abundance of seed, which is simply impossible. Hence there must have been some strange error in these experiments: possibly the bell-glasses may have been removed by some one during the night. The results of these experiments may be passed over as valueless.

† Phytologist, ii. pp. 217, 852; iii. p. 43.

‡ Loudon's Mag. of Nat. Hist. iii. (1830) p. 409.

garden; and if Prof. Henslow took by mistake seeds from one of these plants, especially if it had been accidentally crossed by a Primrose, the result would be quite intelligible. Another case is still more difficult to understand: Dr. Herbert* raised, from seed of a highly cultivated red Cowslip, Cowslips, Oxlips of various kinds, and a Primrose. This case, if accurately recorded, is explicable only on the improbable assumption that the *red* Cowslip was not of pure parentage. With plants of many kinds, when crossed, one species or variety is sometimes strongly prepotent over the other: and instances are known † of one variety crossed by another producing offspring which in certain characters, as in colour, hairiness, &c., have proved identical with the pollen-bearing parent, and quite dissimilar to the mother plant; but I do not know of any good instance of the offspring of a cross perfectly resembling, in a number of important characters, the father alone. Hence we cannot admit that a pure Cowslip crossed by a Primrose would ever produce a Primrose in appearance pure. Although the facts given by Dr. Herbert and Prof. Henslow are difficult to explain, yet until it can be shown that a Cowslip or a Primrose, carefully protected from insects, will occasionally give birth to at least Oxlips, the cases hitherto recorded have little weight in leading us to admit that the Cowslip and Primrose are varieties of one and the same species.

Negative evidence is of little value; but the following facts may be worth giving:—Some Cowslips which had been transplanted from the fields into a shrubbery were again transplanted into highly manured land. In the following year they were protected from insects, artificially fertilized, and the seed thus procured was sown in a hotbed. The young plants were afterwards planted out, some in very rich soil, some in stiff poor clay, some in old peat, and some in pots in the greenhouse; so that these plants, 765 in number, as well as their parents, were subjected to diversified and unnatural treatment; but not one of them presented the least variation except in size—those in the peat growing to almost gigantic dimensions, and those in the clay being much dwarfed.

I do not, of course, doubt that Cowslips exposed during *several* successive generations to changed conditions would vary, and that this would occasionally take place in a state of nature. Moreover, from the law of analogical variation, the varieties of any one

* Transact. Hort. Soc. iv. p. 19.

† I have given instances in my work 'On the Variation of Animals and Plants under Domestication,' vol. ii. p. 92.

species of *Primula* would probably in some cases resemble other species of the genus: thus I raised a red Primrose from seed from a protected plant, and the flowers, though still resembling those of the Primrose, were borne during one season on a long foot-stalk like that of a Cowslip.

With regard to the second class of facts in support of the Cowslip and Primrose being ranked as mere varieties (namely, the well-ascertained existence in a state of nature of numerous linking forms*), if it can be shown that the common wild Oxlip, which stands exactly between the Cowslip and Primrose, resembles in sterility and other essential respects a hybrid plant, and if it can further be shown that the Oxlip, though in a high degree sterile, can be fertilized by the pure parent species, thus giving rise to still finer gradational links, then the presence of such forms in a state of nature ceases to be an argument of any weight in favour of the Cowslip and Primrose being varieties, and becomes, in fact, an argument on the other side. The hybrid origin of a plant in a state of nature can be recognized, first, by its occurrence only where both presumed parent forms exist or have recently existed; and this holds good, as far as I can discover, with the Oxlip; but the *P. elatior* of Jacq., which, as we shall presently see, constitutes a distinct species, must not be confounded with the common Oxlip. Secondly, by the supposed hybrid plant being nearly intermediate in character between the two parent species, and especially by its resembling hybrids artificially made between the same two species. Now the Oxlip is intermediate in character, and is identical in every respect, except in the colour of the corolla, with hybrids artificially produced between the Primrose and the Polyanthus, which latter is a variety of the Cowslip. Thirdly, by the supposed hybrids being more or less sterile when crossed *inter se*: but to try this fairly two distinct plants of the same parentage should always be crossed; for some pure species are more or less sterile with pollen from the same individual plant; and in the case of hybrid dimorphic plants the opposite forms should be crossed. Fourthly and lastly, by the supposed hybrids being much more fertile when crossed with either pure parent-species than when crossed *inter se*, but still not as fully fertile as the parent species.

For the sake of ascertaining the two latter points, I transplanted the group of wild Oxlips before alluded to into my garden. They

* See an excellent article on this subject by Mr. H. C. Watson in the 'Phytologist,' vol. iii. p. 43.

consisted of one long-styled and three short-styled plants, which, except in the corolla of one being slightly larger, resembled each other closely. The trials which were made, and the results which were obtained, are shown in the five following Tables. No less than twenty different crosses are necessary in order to ascertain fully the fertility of hybrid dimorphic plants, *inter se* and with their two parent species. In this instance 256 flowers were crossed in the course of four seasons. I may mention, as a mere curiosity, that if any one were to raise hybrids between two trimorphic species, he would have, in order to ascertain their fertility in all ways, to make 90 distinct unions; and as he would have to try at least 10 flowers in each case, he would be compelled to fertilize 900 flowers and count their seeds. This would probably exhaust the patience of the most patient man.

TABLE I.

Crosses *inter se* between the two forms of the common Oxlip.

Illegitimate union.	*Legitimate union.*	*Illegitimate union.*	*Legitimate union.*
Short-styled oxlip, by pollen of short-styled oxlip: 20 flowers fertilized, did not produce one capsule.	Short-styled oxlip, by pollen of long-styled oxlip: 10 flowers fertilized, did not produce one capsule.	Long-styled oxlip, by pollen of long-styled oxlip: 24 flowers fertilized, produced five capsules, containing 6, 10, 20, 8, and 14 seeds. Average 11·6.	Long-styled oxlip, by pollen of short-styled oxlip: 10 flowers fertilized, did not produce one capsule.

TABLE II.

Both forms of the Oxlip crossed with pollen of both forms of the Cowslip, *P. veris*.

Illegitimate union.	*Legitimate union.*	*Illegitimate union.*	*Legitimate union.*
Short-styled oxlip, by pollen of short-styled cowslip: 18 flowers fertilized, did not produce one capsule.	Short-styled oxlip by pollen of long-styled cowslip: 18 flowers fertilized, produced three capsules, containing 7, 3, and 3 wretched seeds, apparently incapable of germination.	Long-styled oxlip, by pollen of long-styled cowslip: 11 flowers fertilized, produced one capsule, containing 13 wretched seeds.	Long-styled oxlip, by pollen of short-styled cowslip: 5 flowers fertilized, produced two capsules, containing 21 and 28 very fine seeds.

Table III.

Both forms of the Oxlip crossed with pollen of both forms of the Primrose, *P. vulgaris*.

Illegitimate union.	*Legitimate union.*	*Illegitimate union.*	*Legitimate union.*
Short-styled oxlip, by pollen of short-styled primrose: 34 flowers fertilized, produced two capsules, containing 5 and 12 seeds.	Short-styled oxlip, by pollen of long-styled primrose: 26 flowers fertilized, produced six capsules, containing 16, 20, 5, 10, 19, and 24 seeds. Average 15·7. Many of the seeds very poor, some good.	Long-styled oxlip, by pollen of long-styled primrose: 11 flowers fertilized, produced four capsules, containing 10, 7, 5, and 6 wretched seeds.	Long-styled oxlip, by pollen of short-styled primrose: 5 flowers fertilized, produced five capsules, containing 26, 32, 23, 28, and 34 seeds. Average 28·6.

Table IV.

Both forms of the Cowslip crossed with pollen of both forms of the Oxlip.

Illegitimate union.	*Legitimate union.*	*Illegitimate union.*	*Legitimate union.*
Short-styled cowslip, by pollen of short-styled oxlip: 8 flowers fertilized, produced not one capsule.	Long-styled cowslip, by pollen of short-styled oxlip: 8 flowers fertilized, produced one capsule, containing 26 seeds.	Long-styled cowslip, by pollen of long-styled oxlip: 8 flowers fertilized, produced 3 capsules, containing 5, 6, and 14 seeds. Average 8·3.	Short-styled cowslip, by pollen of long-styled oxlip: 8 flowers fertilized, produced 8 capsules, containing 58, 38, 31, 44, 23, 26, 37, and 66 seeds. Average 40·4.

Table V.

Both forms of the Primrose crossed with pollen of both forms of the Oxlip.

Illegitimate union.	*Legitimate union.*	*Illegitimate union.*	*Legitimate union.*
Short-styled primrose, by pollen of short-styled oxlip: 8 flowers fertilized, produced not one capsule.	Long-styled primrose, by pollen of short-styled oxlip: 8 flowers fertilized, produced two capsules, containing 5 and 2 seeds.	Long-styled primrose, by pollen of long-styled oxlip: 8 flowers fertilized, produced eight capsules, containing 15, 7, 12, 20, 22, 7, 16, and 13 seeds. Average 14·0.	Short-styled primrose, by pollen of long-styled oxlip: 8 flowers fertilized, produced four capsules, containing 52, 52, 42, and 49 seeds, some good and some bad. Average 48·7.

We will first consider the results, as shown in the two left-hand compartments in the five Tables, obtained from the short-styled Oxlip when crossed with the long-styled Oxlip, and when crossed with both forms of the Cowslip and Primrose. I may premise that the pollen of two of the short-styled Oxlips consisted of nothing but minute aborted whitish cells; but in the third plant about one-fifth of the grains appeared in a sound condition. Hence it is not surprising that neither the short-styled nor the long-styled Oxlip produced a single seed when fertilized by this pollen. Nor did pure Cowslips or Primroses when illegitimately fertilized by it; but when legitimately fertilized they yielded a few good seeds. The female organs of the short-styled Oxlips, though greatly deteriorated in power, are in a rather better condition than the male organs; for though the short-styled plants yielded no seed when fertilized by the long-styled Oxlip, and hardly any when illegitimately fertilized by pure Cowslips or Primroses, yet when legitimately fertilized by these latter species, especially by the long-styled Primrose, they yielded a moderate supply of seed.

The long-styled Oxlip was more fertile than the short-styled, and about half the pollen-grains appeared sound. It bore no seed when legitimately fertilized by the short-styled Oxlip; but this no doubt was caused by the badness of the pollen of the latter; for when illegitimately fertilized (Table I.) by its own pollen it produced some good seeds, though much fewer in number than self-fertilized pure Cowslips or Primroses would have produced. The long-styled Oxlip likewise yielded a very low average of seed, as may be seen in the third compartments in the Tables, when illegitimately fertilized by, and when illegitimately fertilizing, pure Cowslips and Primroses. The four corresponding legitimate unions, however, were moderately fertile, and one (viz. that between a short-styled Cowslip and the long-styled Oxlip in Table IV.) was nearly as fertile as if both parents had been pure. A short-styled Primrose legitimately fertilized by the long-styled Oxlip (Table V.) also yielded a moderately good average, namely 48·7 seeds; but if the short-styled Primrose had been fertilized by a pure long-styled Primrose it would have yielded an average of seventy-seven seeds. In a previous part of this paper it was shown that a cross between the same forms of the Primrose and Cowslip is more sterile than a cross between the two opposite forms; and we now see in these latter Tables that the same rule almost invariably holds good with crosses between hybrids and the two pure parent species; so that

the same law prevails with the pure unions, the hybrid unions and the hybrid offspring of dimorphic species.

Seed from the long-styled Oxlip fertilized by its own pollen was sown, and three plants, which, according to the usual rule, were all long-styled, were raised. The first of these was identical in every character with its parent. The second bore rather smaller flowers, of a paler colour, almost like that of the Primrose; the scapes were at first single-flowered, but later in the season a tall thick scape, bearing many flowers, like that of the parent Oxlip, was thrown up. The third plant likewise produced at first only single-flowered scapes, with the flowers rather small and of a darker yellow; but it perished early; otherwise it would probably have thrown up an umbel. The second plant also died in September; and the first plant, though all three grew under very favourable conditions, looked very sickly. Hence we may infer that seedlings from a self-fertilized Oxlip would not be able to exist in a state of nature. I was surprised to find that all the pollen-grains in the first of these seedling Oxlips appeared sound; and in the second only a moderate number were bad. These two plants, however, did not reacquire the power of producing the proper number of seeds; for though left uncovered and surrounded by pure Primroses and Cowslips, the capsules were estimated to include an average of only from fifteen to twenty seeds.

From having many experiments in hand, I did not sow the seed obtained by reciprocally crossing Primroses and Cowslips with the Oxlips, and I now regret this; but I ascertained a more interesting point, namely, the character of the offspring from Oxlips in a state of nature growing near both Primroses and Cowslips. The Oxlips were the same plants which were subsequently transplanted and experimented on. From seed thus obtained eight plants were raised, which, when they flowered, might have been mistaken for pure Primroses; but on close comparison the eye in the centre of the corolla was seen to be of a darker yellow, and the peduncles more elongated. As the season advanced, one of these plants threw up two naked scapes, seven inches in height, which bore umbels of flowers of the same character as before. This fact led me to examine the other plants after they had flowered and were dug up; and I found in all that the flower-peduncles sprung from an extremely short common scape, of which no trace can be found in the pure Primrose. Hence these plants are beautifully intermediate between the Oxlip and the Primrose, inclining rather

towards the latter; and we may safely conclude that the parent Oxlips had been fertilized by the surrounding Primroses.

From the various facts now given, there can be no doubt that the common Oxlip is a hybrid between the Cowslip* (*P. veris*, Brit. Fl.) and the Primrose (*P. vulgaris*, Brit. Fl.), as has been surmised by several botanists. It is probable that Oxlips may be produced either from the Cowslip or the Primrose as the seed-bearer, but oftenest from the latter, as I judge from the nature of the stations in which Oxlips are generally found†, and from the Primrose when crossed by the Cowslip being more fertile than the Cowslip by the Primrose. The hybrids themselves are also rather more fertile with the Primrose than with the Cowslip. Whether the Cowslip or the Primrose be the seed-bearing plant, it is probably fertilized by the opposite form of the other species; for we have seen that legitimate hybrid unions are more fertile than illegitimate hybrid unions. Moreover a friend in Surrey found that twenty-nine Oxlips which grew in the neighbourhood of his house consisted of thirteen long-styled and sixteen short-styled plants; now, if the parent plants had been illegitimately united, either the long- or short-styled form would have greatly preponderated in number. The case of the Oxlip is interesting; for hardly any other instance is known of a hybrid spontaneously arising in such large numbers over so wide an extent of country. The common Oxlip (not the *P. elatior* of Jacq.) is found almost everywhere throughout England where the Cowslip and Primrose both grow. In some districts, as I have seen near Hartfield in Sussex and in parts of Surrey, specimens may be found on the borders of almost every field and small wood. In other districts the Oxlip is comparatively rare: near my own residence I have not seen during the last twenty-five years more than five or six plants or groups of plants. It is difficult to conjecture what is the cause of this difference in number. It is almost necessary that a single plant, or several plants of the same form, of one parent species should grow near the opposite form of the other species; and it is further necessary that both species should be frequented by the same kind of moth. It is possible that such moths do not everywhere abound.

Finally, as the Cowslip and Primrose differ in the various characters before specified, as they are in a high degree sterile when

* Godron has shown (Bull. Soc. Bot. de France, tom. x. (1863) p. 178) that *Primula variabilis* is a hybrid between *P. officinalis* (i.e. *P. veris*) and *P. grandiflora*.

† See also on this head Hardwicke's 'Science Gossip,' 1867, pp. 114, 137.

intercrossed, as there is no trustworthy evidence that either plant, when uncrossed, has given birth to the other plant or to any intermediate form, and as the intermediate forms which are often found in a state of nature have been shown to be more or less sterile hybrids of the first or second generation, we must for the future look at the Cowslip and Primrose as good and true species.

PRIMULA ELATIOR, Jacq., or Bardfield Oxlip.

This Primula is found in England only in two or three of the eastern counties; and on the continent it has a somewhat different range from that of the Cowslip and Primrose. It inhabits districts where neither of these species live *. In general appearance it differs so much from the common Oxlip, that no one accustomed to see both in the living state would afterwards confound them; but there is scarcely more than a single character by which they can be distinctly defined, namely the linear-oblong capsule equalling the calyx in length †. The capsules when mature, owing to their length, differ conspicuously from those of the Cowslip and Primrose. Plants propagated by seed in a garden during twenty-five years have kept constant, excepting that in some cases the flowers varied a little in tint and size ‡. Nevertheless Mr. Hewett C. Watson and Dr. Bromfield state § that "exceptional instances to all the characters, taken singly, by which this plant is distinguished from *P. vulgaris* and *veris*" may be occasionally detected; it remains to be discovered whether these intermediate forms are not hybrids between *P. elatior* and *veris*, which often grow together. With respect to differences in function, both the long- and short-styled forms of *P. elatior* are more sterile when fertilized by their own pollen than the corresponding forms of the Cowslip and Primrose when similarly fertilized.

Mr. H. Doubleday, who I believe first called attention to the existence of the Bardfield Oxlip in England, kindly sent me several living plants, which I subjected to trial for the sake of ascertaining whether they differed in their reproductive power from the common Oxlip. I did not think it worth the time and labour to

* For England, see Hewett C. Watson, 'Cybele Britannica,' vol. ii. (1849) p. 292. For the Continent, see Lecoq. 'Géograph. Distrib. de l'Europe,' tom. viii. (1858) p. 142. For the Alps, see Ann. and Mag. Nat. Hist. vol. ix. (1842) pp. 156 & 515.

† Babington's 'Manual of British Botany,' 1851, p. 258.

‡ See Mr. H. Doubleday in the 'Gardeners' Chronicle,' 1867, p. 435, also Mr. W. Marshall, *ibid.* p. 462.

§ Phytologist, vol. i. p. 1001, and vol. iii. p. 695.

ascertain whether the Bardfield oxlip, when crossed with the Cowslip and Primrose, behaved like a distinct species; for if it can be clearly proved not to be a hybrid, and if the Cowslip and Primrose are specifically distinct, I presume that no one will any longer doubt that the *P. elatior* is likewise distinct. The following Table shows the fertility of the four unions between the two forms of this dimorphic species:—

Table VI.

Primula elatior or Bardfield Oxlip.

Nature of union.	Number of flowers fertilized.	Number of good capsules.	Average number of seeds per capsule.	Maximum number in any one capsule.	Minimum number in any one capsule.
Short-styled form, by pollen of long-styled. Legitimate union	10	8	47·7	61	37
Long-styled form, by pollen of short-styled. Legitimate union	10	6	46·5	62	34
Short-styled form, by own-form pollen. Illegitimate union	17	3	12·13	19	9
Long-styled form, by own-form pollen. Illegitimate union	20	4	27·7	49 & 40 *	2

* But these seeds were so poor and small that they could hardly have germinated.

Both forms of this plant, when protected from insects, spontaneously produced a few capsules, some of which contained no seed, and the others, only six in number, included on an average only 7·8 seeds, many of which were bad. The foregoing Table clearly shows that *P. elatior* resembles in the nature of its fertility the many other species of *Primula* which have been experimented on by Mr. J. Scott † and myself. On the other hand, this plant differs almost as widely as is possible from the common Oxlip, both forms of which when legitimately fertilized (see Table I.) were absolutely barren, whereas the two forms of *P. elatior* when similarly fertilized yielded averages of 47·7 and 46·5 seeds. The pollen differs in condition in an equal degree; for in two out of the three short-styled plants of the common Oxlip all the grains, and

† "On the Functions of the Reproductive Organs in the Primulaceæ," Journ. Proc. Linn. Soc. vol. viii. (1864) p. 78.

in the third plant a large majority of the grains, were in an aborted condition, whilst in the short-styled *P. elatior* I could not detect a single bad grain. It may be seen in Table V. that eight long-styled flowers of the Primrose, fertilized by pollen from the long-styled common Oxlip, produced eight capsules, containing, however, only a low average of seeds; but the same number of flowers of the Primrose similarly fertilized by the long-styled Bardfield Oxlip produced only a single capsule. From these various facts it is manifest that *P. elatior* is not a hybrid, and that it differs fundamentally from the common Oxlip.

Finally, although we may feel confident that *Primula veris, vulgaris,* and *elatior* as well as the other species of the genus, are all descended, from some primordial form, yet, from the facts which have been given, we may conclude that they are now as fixed in character as are very many other forms which are universally ranked as species. Consequently they have as good a right to receive distinct specific names as have, for instance, the ass, quagga, and zebra.

Supplementary Note on some WILD HYBRID VERBASCUMS.

In a previous part of this paper I remarked that hardly any other instance could be given of a hybrid spontaneously arising in such large numbers, over so wide an extent of country, as that of the common Oxlip; but perhaps the number of well-ascertained cases of naturally produced hybrid Willows is equally great *. Numerous spontaneous hybrids between several species of *Cistus*, found near Narbonne, have been carefully described by M. Timbal-Lagrave †, and many hybrids between an *Aceras* and *Orchis* have been observed by Dr. Weddell ‡. In the genus *Verbascum*, hybrids are supposed to have often originated § in a state of nature; some of these undoubtedly are hybrids, and several hybrids have originated in gardens; but most of these cases require ||, as Gärtner remarks, verification. Hence the following case is worth recording. I transplanted a young wild plant into my garden for experimental purposes, and when it flowered it plainly differed from the three species of the genus which grow in this neighbourhood. I thought

* Max Wichura, 'Die Bastardbefruchtung.........der Weiden,' 1865.

† Mém. de l'Acad. des Sciences de Toulouse, 5e série, tom. v. p. 28.

‡ Annales des Sc. Nat. 3rd series, Bot. tom. xviii. p. 6.

§ See, for instance, the 'English Flora,' by Sir J. E. Smith, 1824, vol. i. p. 307.

|| See Gärtner, 'Bastarderzeugung,' 1849, p. 590.

that it was a strange variety of *V. thapsus*. It attained the height (by measurement) of 8 feet! It was covered with a net; and most species of *Verbascum*, when thus treated, seed freely Ten flowers were also carefully fertilized with pollen from the same plant; and later in the season, when uncovered, it was freely visited by bees; nevertheless, although many capsules were produced, not one contained a single seed. During the following year this same plant was left uncovered near plants of *V. thapsus* and *lychnitis*; but again it did not produce a single seed. Four flowers, however, which were repeatedly fertilized whilst the plant was under the net with pollen of *V. lychnitis*, produced four capsules, which contained five, one, two, and two seeds; at the same time three flowers were fertilized with pollen of *V. thapsus*, and these produced two, two, and three seeds. To show how unproductive these eight capsules were, I may state that a fine capsule from a plant of *V. thapsus* growing close by contained above 700 seeds. These facts led me to search the moderate-sized field whence the plant had been removed, and I found in it many plants of *V. thapsus* and *lychnitis* and of no other species, and thirty-three plants intermediate in character between these two species. These thirty-three plants differed much from each other. In the branching of the stem they more closely resembled *V. lychnitis* than *V. thapsus*, but in height the latter species. In the shape of their leaves they often closely approached *V. lychnitis*, but some had leaves extremely woolly on the upper surface and decurrent like those of *V. thapsus*; yet the degree of woolliness and of decurrency did not always go together. In the petals being flat and remaining open, and in the manner in which the anthers of the longer stamens were attached to the filaments, these plants all took more after *V. lychnitis* than *V. thapsus*. In the yellow colour of the corolla they all resembled the latter species. On the whole, these plants appeared to take rather more after *V. lychnitis* than *V. thapsus*. On the supposition that they are hybrids, it is not an anomalous circumstance that they all should have produced yellow flowers; for Gärtner crossed white- and yellow-flowered varieties of *Verbascum*, and the offspring thus produced never bore flowers of an intermediate tint, but either pure-white or pure-yellow flowers, generally of the latter colour *.

My observations were made in the autumn; so that I was able to collect some half-matured capsules from twenty of the thirty-three intermediate plants, and likewise capsules of the pure

* Bastarderzeugung, p. 307.

V. lychnitis and *thapsus* which grew in the same field. All the latter were charged with perfect but immature seeds, whilst the capsules of the twenty intermediate plants did not contain one single perfect seed. These plants, consequently, were absolutely barren. From this fact, from the one plant which was transplanted into my garden yielding when artificially fertilized with pollen from *V. lychnitis* and *thapsus* some seeds, though extremely few in number, from the fact of the two pure species growing in the same field, and from the intermediate character of the sterile plants, there can be no doubt that they are hybrids. Judging from the position in which they were chiefly found, I am inclined to believe they are descended from *V. thapsus* as the seed-bearer, and *V. lychnitis* as the pollen-bearer.

It is known that many species of *Verbascum*, when the stem is jarred or struck by a stick, cast off their flowers *. This is the case with *V. thapsus*, as I repeatedly observed. The corolla first separates from its attachment, and then the sepals spontaneously bend inwards so as to clasp the ovarium; and by this movement, in the course of two or three minutes, the corolla is pushed off. This does not occur with quite young flowers barely expanded. *Verbascum lychnitis* and, as I believe, *V. phœniceum* do not cast their corollas, however often and severely they may be struck. In this curious property the above-described hybrids take after *V. thapsus*; for I observed to my great surprise that when I pulled off the flower-buds surrounding the flowers round which I wished to tie threads as a mark, the slight jar invariably caused the corollas to fall off.

These hybrids are interesting under several points of view. First, from the number found in various parts of the same moderate-sized field. That the parent plants should be crossed so frequently is the more surprising, as the species of *Verbascum* do not secrete nectar; but they are frequented by pollen-gathering bees. Bees, though they devour much pollen, are beneficial to these plants, by crossing distinct individuals of the same species; for I have found on trial that plants raised from crossed seed are more vigorous than those from self-fertilized seed; on the other hand, as we now see, bees often bastardize and deteriorate the species. Secondly, these hybrids are highly remarkable from dif-

* This was first observed by Correa de Serra. See Sir J. E. Smith's 'English Flora,' 1824, vol. i. p. 311. Also 'Life of Sir J. E. Smith,' vol. ii. p. 210. I was guided to these references by the Rev. W. A. Leighton, who observed this same phenomenon in *V. virgatum*.

fering much from each other; for hybrids of the first generation, when raised from uncultivated plants, are generally uniform in character. That these wild plants belonged to the first generation, we may safely conclude, from the absolute sterility of all those observed by me in a state of nature, and of the one plant in my garden, excepting when artificially and repeatedly fertilized with pure pollen; and then the number of seeds produced was extremely small. From these hybrids varying so much, an almost perfect series of forms connecting the two parent species, though these are widely distinct, could easily have been selected. This case, like that of the common Oxlip, shows that botanists ought to be cautious in inferring the specific identity of two forms from the presence of intermediate gradations; nor in the many cases in which hybrids are moderately fertile would it be easy to detect a slight degree of sterility in plants growing in a state of nature and liable to be fertilized by either parent species. Thirdly and lastly, these hybrids offer an excellent illustration of one of the many profound remarks made by that admirable observer Gärtner, namely, that although plants which can be crossed with ease generally produce moderately fertile offspring, yet well-pronounced exceptions to the rule occur; and here we have species of *Verbascum* which are evidently crossed with the greatest ease, but produce hybrids which are excessively sterile.

Note on Cocoa-nuts in the Seychelles Islands. By Dr. E. PERCEVAL WRIGHT, F.L.S., in a Letter to Dr. HOOKER.

[Read Jan. 16, 1868.]

AT Silhouette, where there is one of the most complete and best-paying Cocoa-nut farms, there is to be found one Cocoa-nut tree, of moderate age, growing in wood-soil, and surrounded by other trees, all in full bearing, but itself seldom producing a well-developed fruit. I was not there when it was in blossom; but I saw it with four stalks of ordinary dimensions, one of which, when examined closely, was seen to consist of a number of strangely metamorphosed fruits. These were but hastily examined by me at the time; but the conclusion I came to on the spot was, that in none of the fruits were the hard shells developed, and that in all there were two carpels. After the fruit reached a certain stage of development it split, giving the appearance of a flower of which the calyx would consist of the epidermic and fibrous portion of the fruit, and the corolla of the soft shell (detached completely from the former). On one branch there was a fairly developed fruit, which, on opening, was found to consist of two carpels, with a false development between them, redividing the nut into two.

There was also one other fruit on the tree, which I took away with me, but have not opened. It has but two edges, and is evidently made up of two carpels. I also took a branch of the altered fruits, which I hope will come safely to hand. There was not another instance to be found on the estate, of, say, some 180,000 trees.

On the Structure and Fertilization of *Liparis Bowkeri*. By Mrs. M. E. BARBER, Highlands, Graham's Town, South Africa.

[Read Feb. 6, 1868.]

L. Bowkeri, Harv., is one of the numerous discoveries of T. H. Bowker, Esq., of the frontier armed and mounted police. It was first discovered in one of the numerous forest-clad and rocky ravines that surround Fort Bowker, on the banks of the Bashu River, nearly a hundred miles beyond the colony, and it was figured by Dr. Harvey in the second volume of the 'Thesaurus Capensis' (t. 109).

In cultivation *L. Bowkeri* thrives well, and blossoms freely. I have had a group of them in my flower-garden for several years,

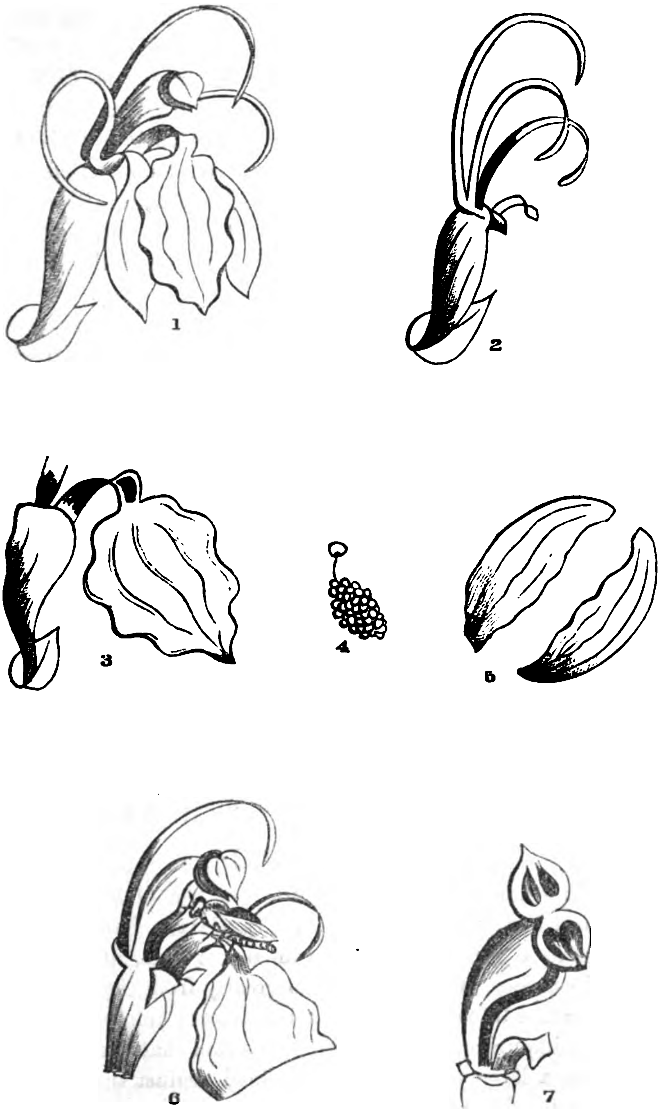
where they have never failed to blossom profusely; and yet, strange to say, they have produced no seed, each blossom fading away and falling to the ground with its pollinia still beneath the operculum upon the apex of the column; and as it is impossible for the fertilization of this orchid to take place excepting through the agency of insects, I have been led to the conclusion that the little creature to whose care the fertilization of *L. Bowkeri* is entrusted is not an inhabitant of our neighbourhood, or its office would not thus have been neglected.

The structure of *L. Bowkeri* is peculiar, and wonderfully adapted to suit the requirements of the plant. The plants grow in bunches, as do the various species of *Eulophia*, *Lissochilus*, &c., and have handsome, light-green, and broadly ovate undulated leaves; the scape, which rises about six inches, usually bears from 4 to 5 blossoms of a light-green colour, slightly shaded with brown; the back sepal, like the petals (see fig. 2), is linear, and subulate; the lateral sepals (see fig. 5), which are broadly falcate, are turned towards, and slightly beneath, the limb of the labellum (see fig. 1); the petals (like the back sepal) are linear (see fig. 2) and subulate, with their points bent inwards, inclining towards the centre of the flower, and forming, together with the back sepal, a protection around the apex of the column, as if it were to guard against the approach of insects to the nectary by all other ways excepting that of the labellum; the column (see fig. 1), which is somewhat terete and partly winged near the apex, stands out over the nectary in the centre of the flower; and in two small cavities upon its apex (see fig. 7) are placed the waxy pollinia, neatly covered by an operculum or lid, which is articulated with the upper part of the column (see fig. 7); beneath this projecting column, and below the anthers, is placed the stigmatic surface. The claw of the labellum is concave, and strongly arched upwards and towards the stigmatic tissue, thence descending and forming, together with the base of the column, the honey-coloured nectary. Attached to this claw (see fig. 3) is the spreading, undulate, and ovate limb standing out in front, and nearly resembling the iron step of a carriage, forming a tempting perch or landing-place for an insect in search of food.

The nectary, though apparently glistening and of a honey-colour, produces no nectar. I have examined many, and invariably found them empty!

The various species of our Lepidoptera would, I imagine, be of no avail in the fertilization of *L. Bowkeri*; the slender and

attenuated nature of their proboscis would in all probability fail to remove the operculum that shields the pollinia; but amongst



the numerous tribes of our Hymenoptera and Diptera are many small bees and flies admirably adapted to perform this work.

Insects in search of honey would naturally alight upon the step-shaped limb of the labellum, and thence, climbing over its arched claw, would descend into the centre of the flower; obviously, in so doing, they would not remove the pollinia, as the pressure of their bodies upon the operculum would keep it effectually closed; but in retiring backwards out of the flower (see fig. 6), the head or thorax of the insect would come in contact with the projecting point of the operculum; it would then be raised or opened, and one or both of the pollinia would be carried away upon the head of the insect, and this would be done without fertilizing the stigma of the flower which had been entered. The insect thus armed with the pollinia upon its head would go on to the next blossom, and, in descending into the flower over the arched claw of the labellum, would deposit one or both of the pollinia upon the glutinous stigmatic surface of the column while the operculum was yet closed, and, again, in retiring from the flower would take away another pair of pollinia, and so on until the work of fertilization was completed.

By this clever contrivance no flower would be fertilized with its own pollen; and if the insect passed on, many flowers would be fertilized with the pollen from other plants, which would be of great importance to them; neither would the officiating insect be encumbered by an inconvenient number of pollinia, which, in some cases, obstructs the work of fertilization, and causes great inconvenience to the agent thus employed.

On the true *Fuchsia coccinea* of Aiton.

By Jos. D. Hooker, M.D., F.R.S., D.C.L., LL.D., &c.

[Read Dec. 19, 1867.]

When going through the greenhouses of the Oxford Botanic Garden, last September, with Mr. W. H. Baxter, I saw, amongst many curious old plants, two specimens, in pots, of a Fuchsia named *F. coccinea*, which differed so greatly from the plant commonly so called in cultivation that I could not help being struck by it. On inquiring their history, I was told that they had been raised from a large plant formerly trained against the end of an old stove, one of the earliest erected in England, and now pulled down. This information Mr. W. Baxter had subsequently confirmed by his venerable father, who added that the large old

plant had been introduced from Kew; and he further sent me a dried specimen, cut in 1813, from the Kew plant, as being probably the same as that from which Aiton, in 1788, described his *F. coccinea*.

Having long been anxious to recover the originally introduced garden Fuchsia, which is now so extremely hybridized that it is difficult to procure it pure, I was much interested in this account, and I determined to follow it up at Kew, when I found, as I expected, that the well-known Fuchsia of our gardens, a native of Chili, and a rather robust glabrous plant, with slender petioles, and leaves more or less narrow at the base, is a totally different thing from Aiton's plant, the latter having very slender pilose twigs, very short petioles, leaves cordate at the base, foliage which turns of a purplish-scarlet in autumn, and whose native country is, strange to say, to this day unknown! All the specimens known of it, whether living or dead, appeared to have been procured from the original Kew plant, published by Aiton in 1789, and of which I have seen excellent dried specimens in the Banksian and Smithian Herbaria, gathered in Kew in the year (1788) before the date of the publication of the two volumes of the Hortus Kewensis, and others in the Hookerian and Benthamian Herbaria, obtained also from Kew, by Sims, Forsyth, and others.

It may be as well here to clear up the history of the genus *Fuchsia*, in reference to the true *F. coccinea* and the plant now cultivated under this name, which latter must give way to that of *F. magellanica*.

The genus *Fuchsia* was established by Linnæus in 1737, after Plumier, who had proposed it in 1703, upon a New-Granada plant. Feuillée, the South-American traveller, had, however, in 1724–1725, published his 'Itinerary,' in the appendix to which, on the Medicinal Plants of Chili, p. 6 and tab. 47, is figured and described as "Thilco" a species of *Fuchsia*. What Feuillée's "Thilco" is I cannot determine; it is described as pubescent (like Aiton's *F. coccinea*), but has the leaves and petioles of *F. magellanica*, whilst it differs from all the genus in having pentamerous flowers!

In 1789 *F. coccinea* was described by Aiton in the second volume of the 'Hortus Kewensis,' from a plant introduced by Messrs. Lee, of Hammersmith, brought, it is said, by Captain Firth, from Chili; but Feuillée's "Thilco" is cited as a synonym, with no allusion to the different number of parts of the flower. What this *F.*

coccinea of Aiton was we now know with certainty, as stated above, from the dried specimens in two contemporaneous Herbaria, both taken from Aiton's plant in 1788.

In 1789, a *F. coccinea* was figured by Sims in the Botanical Magazine (tab. 97), under which both Feuillée's plate and the 'Hortus Kewensis' are quoted; and it is stated to have been first introduced into the Royal Gardens, Kew, by Captain Firth, in 1788. The figure accurately represents the plant now commonly known as *F. coccinea*, and which is the *F. magellanica* of Lamarck. Curiously enough, Sims's own specimen, marked *F. coccinea* in his herbarium (now in the Benthamian at Kew) is not the plant he figured in the Botanical Magazine, but Aiton's *F. coccinea*!

In 1791, Salisbury, in his 'Stirpes rariores' (p. 13, tab. 7), published a capital figure and description of Aiton's *F. coccinea*, under the name of *F. elegans*; he does not state why he changed the name, and gives Brazil as its habitat, adding that it was introduced by Vandelli.

In 1792, Willdenow, in Uster's 'Annales' (vol. iii. p. 37, tab. 6), figures and describes *F. coccinea* of Aiton, but so loosely that either plant may be meant.

In 1793–4, Schneevoogt's 'Icones' appeared in Holland, wherein Aiton's *F. coccinea* is beautifully figured and described as a Chilian plant, under the name of *Nahusia coccinea* (n. 21), with a reference for that name to S. J. Van Geuns in de Verhandl. van het provinc. Utr. Genootsch. vi. Deel, a reference I cannot confirm, and which my kind friend Mr. Bennett has vainly tried to obtain for me. The name *Nahusia* is given in honour of the Professor of Chemistry at Utrecht. Aiton's 'Hortus Kewensis' is quoted for this plant, "excluso Linnæi synonymo."

In 1796, Vandelli's genus *Quiliusa* was published by Roemer in his 'Scripta;' and to it is referred without doubt (by Roemer) Aiton's *F. coccinea*. It is stated to be a Brazilian plant; but the description is insufficient to identify it.

In 1796 also Salisbury's 'Prodromus' was published, wherein this author (p. 279) again changes the name to *F. pendula*, quoting his 'Stirpes' for the name, and further quoting Curtis, Aiton, and Vandelli.

In 1799, the second volume of Willdenow's 'Species Plantarum' appeared, in which (p. 340) *F. coccinea* is described, but here, again, too loosely for identification. Aiton's plant, and

Feuillée's *Thilco* are referred to it, as is Lamarck's *F. magellanica*, which, having been published in 1786, should have been the adopted name. Chili is given as the habitat.

Lastly, in 1811, the second edition of Aiton's 'Hortus Kewensis' was published, in which the reference to Feuillée's "Thilco," which appeared in the first edition, is omitted; but Willdenow, Salisbury, Schneevoogt, and the Botanical Magazine are all quoted. The two species are therefore here confounded.

Beyond this it is not necessary to go, as every succeeding author who describes or mentions *F. coccinea* alludes to *F. magellanica*; and it only remains to give the contrasting diagnoses of the species.

1. F. COCCINEA, *Ait. Hort. Kew.* Ed. 1. vol. ii. p. 8.
   Ramis gracilibus petiolis foliisque subtus pilosis, foliis ovato-oblongis basi cordatis subdentatis, petiolis brevissimis.—*F. elegans*, Salisb. Stirp. Rar. p. 13, tab. 7.—*Nahusia coccinea*, Schneevoogt, Icones, p. 21.

Patria ignota. Aspectu species Brasilienses magis quam Chilenses revocat.

2. F. MAGELLANICA, *Lamk. Encycl.* vol. ii. p. 565. Ramulis petiolis foliisque subtus glaberrimis v. minute puberulis, foliis ovato-oblongis oblongo-lanceolatisve basi acutis rotundatisve, petiolis gracilibus.—*F. coccinea*, Bot. Mag. t. 97.—*F. macrostemma*, Ruiz et Pav. Fl. Per. iii. p. 88, tab. 324. f. 6.—*F. gracilis*, Lindl. Bot. Reg. t. 847, inclusis varr. *multiflora* et *tenella*, t. 1052.—*F. decussata*, Graham, Bot. Mag. t. 2507, non Ruiz et Pav.

Patria Chili, et Fuegia.

Notes on Mosses, &c., collected by Mr. JAMES TAYLOR on the shores of Davis Straits. By G. DICKIE, A.M., M.D., F.L.S.

[Read January 16, 1868.]

SOME remarks on the Algæ of Davis Straits were published in the ninth volume of the Linnean Society's Journal; Mr. James Taylor, by whom the materials were collected, requested me to prepare similar notes on the Mosses, Hepaticæ, and Lichens of the same region *.

Mr. Taylor has the following remarks in his Notes:—"On the east side of Davis Straits the space examined extends from

* Some of the Mosses and Hepaticæ had been previously forwarded by Mr. Taylor to Mr. Mitten; and a few were examined by Mr. Wilson at my request

Disco Island to the southern part of Melville Bay; and on the west side, from Cape Enderby to Pond's Bay. On the east side the excursions were chiefly along the coast, rarely exceeding two miles inland; on the west side also the coast-line alone was explored, excepting at Cape Searle and Cumberland Sound, where explorations were made as far as five or six miles inland. With more time and better arrangements for penetrating further, a much more extensive collection might have been made.

The variety of surface is very considerable; lofty hills, valleys, and deep ravines abound; in some districts are extensive plains covered with shingle, where *Conostomum boreale* and *Racomitrium lanuginosum* are in the greatest profusion; again, there are large tracts where *Ceratodon purpureus* and *Psilopilum arcticum* are plentiful. Elsewhere, at various elevations, there are morasses and peat-bogs, where species of *Sphagnum* and other aquatic mosses find a suitable habitat. In other quarters we meet with steep cliffs, in the crevices of which, along with Ferns and other plants, there grow various species of *Bryum* and *Hypnum*; the numerous boulders of various sizes are covered with tufts of *Andreæa*, &c."

MUSCI.

Andreæa petrophila, *Ehrh.* East and west sides of D. Straits, common.

A. Blyttii, *Schss.* Dark Head; Wilcox Point; Cape Searle.

Sphagnum acutifolium, *Ehrh.* East and west sides; common.

S. fimbriatum, *Wils.* Associated with the last.

S. rubellum, *Wils.* Upernavik; Cape Searle; and Cumberland Sound.

Voitia hyperborea, *Gr. & Arn.* Dark Head; Upernavik; Cape Searle; and Cumberland Sound.

Anœctangium compactum, *Schl.* Disco; Frau Islands; Wilcox Point.

Weissia crispula, *Hedw.* Frequent on both east and west sides.

Cynodontium polycarpum, *Ehrh.* Disco; Dark Head; Upernavik; Scott's Bay; and Cumberland Sound.

C. virens, *Hedw.* Hassen Island; Dark Head, &c. &c.

Var. β. Wahlenbergii. Cape Adair; Cape Searle; and Cumberland Sound.

Dicranum elongatum, *Schw.* Frequent on the west side.

D. fuscescens, *Turn.* Cape Adair and Home Bay.

Var. γ. plexicaule. Wilcox Point; Cape Searle.

D. scoparium, *L.* Various places, east side.

Blindia acuta, *Dicks.* Frequent on east and west sides.

Anacalypta latifolia, *Schw.* On the west side only, and very rare. Scott's Bay; Cumberland Sound.

Distichium capillaceum, *L.* East and west sides; common.

Var. β. brevifolium. Cumberland Sound.

D. inclinatum, *Hedw.* Hassen Island; Cape Walker; Cumberland Sound.

Ceratodon purpureus, *L.* East and west sides, common.

Desmatodon systilius, *Br. & Sch.* Cape Adair; Cape Searle; and Kingaite, Cumberland Sound.

Barbula fragilis, *Wils.* Disco, and to 74° N.; and Cumberland Sound.

B. mucronifolia, *Schwarz.* Disco; Dark Head; Upernavik; and Cumberland Sound.

B. ruralis, *L.* Frau Islands and Wilcox Point.

Grimmia apocarpa, *L.* Frequent on both east and west sides.

* G. platyphylla, *Mitten.* Dark Head; Cape Searle, &c.

G. pulvinata, *L.* Disco Island; and Kingaite, Cumberland Sound.

G. apiculata, *Hsch.* Cape Adair and Cape Searle.

G. elongata, *Kaulf.* Disco Island; and Kikerton Islands, Cumberland Sound.

Racomitrium lanuginosum, *Hedw.* East and west sides, abundant.

Amphoridium lapponicum, *Hedw.* East and west sides, frequent.

Ulota curvifolia, *Wahl.* Cape Adair; Cape Searle; and in Cumberland Sound.

Orthotrichum speciosum, *Nees.* Frequent on east and west sides.

O. arcticum, *Schr.* Not unfrequent on both east and west sides.

Eucalypta rhabdocarpa, *Schwarz.* Cumberland Sound, rare.

E. ciliata, *Hedw.* Cape Adair and Cape Searle.

Tayloria splachnoides, *Schl.*, var. γ. angustifolia. Kikerton Islands, Cumberland Sound, very rare.

Tetraplodon sunioides, *L.* East and west sides, frequent.

Splachnum Wormskjoldii, *Hornm.* On east and west sides, frequent.

Leptobryum pyriforme, *L.* On east and west sides, but not frequent.

Webera polymorpha, *Hepp & Hsch.* Kingaite, Cumberland Sound.

* Mr. Mitten in Journal of Linnean Society, vol. viii.

W. nutans, *Schrb.* Cape Adair; Home Bay; and Cumberland Sound.

W. cruda, *Schrb.* East and west sides, frequent.

W. cucullata, *Hedw.* Dark Head.

W. Ludwigii, *Spr.* East and west sides, but rather local.

Var. β. gracile. Cumberland Sound.

Bryum arcticum, *R. Br.* East and west sides, frequent.

B. purpurascens, *R. Br.* East and west sides, but not common.

B. pendulum, *Hsch.* Disco Island.

B. calophyllum, *R. Br.* West side, frequent.

B. bimum, *Schreb.* Kingaite, Cumberland Sound.

B. pallescens, *Schleich.* Frau Islands; and Cape Adair.

B. argenteum, *L.* East and west sides, frequent.

Zieria demissa, *Hsch.* East and west sides, very local.

Mnium rostratum, *Schrd.* Kingaite, Cumberland Sound, rare.

M. serratum, *Schrd.* Cape Searle, rare.

M. hymenophylloides, *Hüb.* Cumberland Sound.

Meesia uliginosa, *Hedw.* East and west sides, frequent.

Aulacomnion palustre, *L.* East and west sides, frequent.

A. turgidum, *Wahl.* East and west sides, very common.

Bartramia ithyphylla, *Brid.* Cumberland Sound, rare.

B. pomiformis, *L.* East and west sides, not common.

Var. β. crispa. Disco Island.

Conostomum boreale, *Lév.* East and west sides, common.

Oligotrichum hercynicum, *Ehrh.* Kikerton, Cumberland Sound, rare.

Psilopilum arcticum, *Br. & Sch.* Cumberland Sound.

Pogonatum alpinum, *L.* East and west sides, frequent.

P. dentatum, *Brid.* Cumberland Sound, rare.

Polytrichum piliferum, *Schrb.* Disco; and in Cumberland Sound.

Myurella julacea, *Vill.* East and west sides, associated usually with *Grimmia apocarpa.*

* Orthothecium rubellum, *Mitten.* Cape Adair; Cape Searle.

O. rufescens, *Dicks.* Cape Searle.

O. chryseum, *Schwgr.* Dark Head.

Camptothecium nitens, *Schreb.* East and west sides, frequent.

Plagiothecium pulchellum, *Hedw.* Capes Adair and Searle; and in Cumberland Sound.

Hypnum Kneiffii, *Br. & Sch.* East and west sides; frequent.

H. exannulatum, *Gümb.* East and west sides, very local.

* Mr. Mitten in Journal of Linnean Society, vol. viii.

H. fluitans, *Hedw.* East and west sides, frequent.
H. revolvens, *Lév.* East and west sides, very common.
H. uncinatum, *Hedw.* East and west sides, frequent.
H. reptile, *Mich.* West side, rare; only in Cumberland Sound.
* H. plicatile, *Mitten.* East shores of Davis Straits.
H. hamulosum, *Br. & Schr.* East and west sides, frequent.
H. sarmentosum, *Wahl.* East and west sides, frequent.
H. turgescens, *Schr.* East and west sides, local.

HEPATICÆ.

Gymnomitrium concinnatum, *Corda.* East and west sides, common.
Sarcoscyphus Ehrhardti, *Corda.* East and west sides, but not common.
Scapania nemorosa, *Hook.* East and west sides, common.
S. undulata, *M. & N.* East side only, very local.
Jungermannia setiformis, *Ehrh.* East and west sides, common.
J. inflata, *Huds.* Frau Islands, very local.
J. minuta, *Crantz.* East and west sides, common.
J. barbata, *Schreb.* East and west sides.
J. islandica, *N. ab E.* East and west sides, rare.
J. divaricata, *Linn.* East and west sides, frequent.
J. cavifolia, *Mitten.* Dark Head.
Ptilidium ciliare, *N. ab E.* East and west sides, common.
Frullania Tamarisci, *N. ab E.* Frau Islands and Wilcox Point.
Marchantia polymorpha, *L.* Cumberland Sound.

LICHENES.

Sphærophoron coralloides, *Pers.* East and west sides, frequent.
Bæomyces roseus, *Pers.* Cape Adair and Home Bay.
Cladonia fimbriata, *Hoffm.* Cape Searle.
C. gracilis, *Hoffm.* Cape Adair, Home Bay, and Cape Searle, frequent.
C. rangiferina, *Hoffm.* Very common, as also var. γ. alpestris.
C. uncialis, *Hoffm.* Very abundant, as well as var. α. lacunosa.
C. bellidiflora, *Schær.* Cape Adair; Home Bay.
C. deformis, *Hoffm.* Not unfrequent.
Stereocaulon paschale, *Ach.* East and west sides, common.
Siphula ceratites, *Fr.* Frau Islands; Wilcox Point; Cape Searle, Dark Head.
Thamnolia vermicularis, *Ach.* East and west sides.

* Mitten in Journal of Linnean Society, vol. viii. p. 40.

Neuropogon melaxanthus, *Nees et Flot.* Hassen Island, very local, only on trap rocks.

Alectoria divergens, *Wahl.* Frequent.

A. bicolor, *Nyl.* Very frequent.

A. jubata, *Ach.* Dark Head, rather local.

A. ochroleuca, *Nyl.* Various forms of it, frequent.

Dactylina arctica, *Hook.* Dark Head, and Cape Searle.

Dufourea madreporiformis, *Ach.* Frequent on both sides of the Straits.

Ramulina scopulorum, *Ach.* Dark head, very rare.

Cetraria islandica, *Ach.* All the forms of this variable species abundant everywhere.

C. aculeata, *Fr.* Greenland shore.

Platysma cucullatum, *Hffm.* Very abundant.

P. fahlunense, *Hffm.* On both east and west sides, frequent.

P. juniperinum, *Nyl.* Eastern shore of Davis Straits.

Nephromium lævigatum, *Ach.* Frau Islands, very local.

Peltigera venosa, *Hffm.* Kikerton Islands in Cumberland Sound.

P. scabrosa, *Th. Fr.* Greenland shore, and also in Cumberland Sound, but local.

Solorina crocea, *Ach.* Dark Head.

S. sacchata, *Ach.* Cumberland Sound, very local.

Sticta scrobiculata, *Ach.* Dark Head, rare.

Parmelia caperata, *Ach.* Cumberland Sound, rare.

P. saxatilis, *Ach.* East and west sides, var. γ. omphalodes, abundant.

P. stygia, *Ach.* East and west sides, frequent.

P. lanata, *Nyl.* Frau Islands; and Dark Head &c.

P. incurva, *Fr.* Kikerton Islands, Cumberland Sound.

P. ambigua, *Ach.* Frau Islands; Wilcox Point; Dark Head.

P. centrifuga, *Ach.* Dark Head, rare.

P. stellaris, *Wallr.* Dark Head, rare.

P. elegans, *Ach.* East and west sides, abundant.

P. chrysoleuca, *Ach.* Cape Searle, very local.

P. murorum, *Fries.*

Var. δ. Cape Adair.

Umbilicaria Pennsylvanica, *Hffm.* Found only in Cumberland Sound, rare.

U. proboscidea, *DC.*

Var. γ. arctica. Eastern shore.

U. cylindrica, *Ach.* With the former.

U. hirsuta, *Ach.* East and west sides; abundant in Cumberland

Sound; specimens measured seven inches across; much smaller on the east side.

U. vellea, *L.* On east and west sides.

U. hyperborea, *Hffm.* Cumberland Sound.

U. erosa, *Hffm.* Frau Islands, and in Cumberland Sound.

Pannaria hypnorum, *Vahl.* Cape Adair; Cape Searle; Dark Head.

Lecanora frustulosa, *Dicks.* Cumberland Sound.

L. atra, *Huds.* Cape Adair, &c.

L. subfusca, *L.* Cape Searle, &c., frequent.

L. coarctata, *Ach.* Cape Adair.

L. pallescens, *L.* Cumberland Sound.

L. tartarea, *L.* Very general.

L. ventosa, *Ach.* Common.

L. cerina, *Ach.* Frequent.

L. aurantiaca, *Nyl.* Eastern shore.

Lecidea contigua, *Fries.* Common.

L. squalida, *Ach.* Cumberland Sound.

L. atro-rufa, *Schær.* Eastern shores.

L. decolorans, *Hoffm.* East and west sides.

L. sanguinaria, *Ach.*

Var. β. Cape Adair, rare.

Urceolaria scruposa, *L.* Eastern shores.

In conclusion it may be stated that Mr. Taylor's collections were made in 1856, 1857, 1858, and 1861, and notwithstanding the limited opportunities, in consequence of other duties, must be considered on the whole very complete; respecting the Mosses, it may be observed that the following are, I believe, new to the Arctic list:—*Anacalypta latifolia*, *Barbula fragilis*, *Grimmia apiculata*, *G. elongata*, *Ulota curvifolia*, *Meesia uliginosa*, *Hypnum Kneiffii*, *H. turgescens*, *Andreæa Blyttii*, and, in addition, the new species described by Mr. Mitten, viz. *Grimmia platyphylla*, *Orthothecium rubellum*, *Hypnum plicatile*, *and Jungermannia cavifolia*.

Note on the Structure of *Genista tinctoria*, as apparently affording facilities for the intercrossing of distinct flowers. By the Rev. George Henslow, M.A., F.L.S.

[Read April 16, 1868.]

In a note on the structure of the flowers of *Indigofera speciosa* (Linn. Journ. vol. ix. p. 355), the present writer observed a remarkable peculiarity in the claws of the keel petal—in that they curled backwards, if the flower was touched in imitation of an insect thrusting its proboscis to the base of the calyx. The expanded part of the carina dropped down vertically, and the alæ, having lost their support, fell laterally, so that the stamens and pistil became exposed. A somewhat similar peculiarity is found to obtain in the genus *Genista*; but in this instance the claws of the alæ curl back as well as those of the keel petals. The alæ, moreover, are not supported by horn-like processes projecting from the sides of the keel as in *Indigofera*, but cling to the latter by means of small protuberances, which fit into corresponding depressions on the keel petals. Various modifications of this latter point of structure are of very general occurrence amongst papilionaceous corollas.

On passing any pointed object, in imitation of an insect, down the medial line of the vexillum, the claws of the alæ and carina instantly curl backwards, and throw the expanded portions of those petals into a downward and vertical position, at the same time apparently jerking the stamens and pistil upwards, so that, when equilibrium is restored, the staminal column is almost erect and remains closely adpressed against the vexillum.

There is no tendency to curvature of the stamens as occurs in *Medicago* (see Linn. Journ. vol. ix. p. 327), though a slight upward movement seems to take place as the petals fall; their monadelphous character would probably, as there suggested, prevent such curvature.

No opportunity occurred of observing what insects effected the above process; but cut flowers, allowed to open in water, invariably withered without expanding further by the depression of the petals as described.

Extract from a Letter from CUTHBERT COLLINGWOOD, M.B., F.L.S., on a Luminous Fungus from Borneo.

[Read March 7, 1867.]

THE fungus grows in small clusters upon roots of trees. It is of a light cream-colour, and possesses a strong fungoid, or, rather, *Agaric* odour. It was abundant in a small copse, and had apparently newly sprung up; for on searching the spot the next day I could only find brown aud shrivelled specimens; and two nights after, in the same place, I searched in vain for a good specimen, although much rain had fallen in the mean time. The specimens I gathered while in a state of luminosity had, the next morning, thrown out abundance of whitish spores.

With regard to the remarkable characteristic of luminosity, the night being dark the fungi could be very distinctly seen, though not at any great distance, shining with a soft pale-greenish light. Here and there spots of much more intense light were visible; and these proved to be very young and minute specimens. The older specimens may more properly be described as possessing a greenish luminous *glow*, like the *glow* of the electric discharge—which, however, has quite sufficient to define its shape and, when closely examined, the chief details of its form and appearance. The luminosity did not impart itself to the hand, and did not appear to be affected by the separation from the root on which it grew, at least not for some hours.

I think it probable that the mycelium of this fungus is also luminous; for upon turning up the ground in search of small luminous worms, minute spots of light were observed, which could not be referred to any particular object or body when brought to the light and examined, and were probably due to some minute portions of its mycelium.

Mr. Hugh Low has assured me that he saw the jungle all in a blaze of light (by which he could see to read) as, some years ago, he was riding across the island by the jungle-road, and that this luminosity was produced by an *Agaric* *.

* [The fungus mentioned in the above letter appeared to be identical with *Agaricus Gardneri*, Berk., a Brazilian species. Luminosity in fungi has been observed in various parts of the world (see Berkeley's 'Introduction to Cryptogamic Botany,' p. 265).—SEC. L. S.]

Notes on the Structure and Fertilization of the genus *Bonatea*, with a special Description of a Species found at Bedford, South Africa. By J. P. Mansel Weale, B.A. Communicated by Charles Darwin, Esq., M.A., F.R.S., F.L.S.

[Read March 7, 1867.]

Bonatea Darwinii, sp. n. Foliis vagina elongata concavis, racemo denso, sepalis anticis contortis concavis falcato-acuminatis, extrorsum emarginatis pone petala antica depressis, petalorum parte postica lata patente, stigmate supra subextrorsum lateraliter canaliculato.

Tubera ovato-oblonga. *Caulis* 6 poll. ad 1 ped. altus, undique foliatus. *Foliorum* vaginæ elongatæ caulem arcte includentes, laminæ patentes, 2–7 poll. longæ, 2–6 lin. latæ, concavæ, lineari-lanceolatæ v. ovato-lanceolatæ; folia superiora abrupte ad vaginas reducta. *Racemus* 6–24-florus, densus. *Bracteæ* membranaceæ, lanceolato-acuminatæ, ovaria arcte vaginantes. *Flores* galeati; galea e sepalo postico concavo segmentisque posticis petalorum anticorum composita; sepala antica contorta, concava, falcato-acuminata, extrorsum emarginata, pone petala antica depressa, petalorum pars antica sepalis æquilonga, usque ad basin bipartita sinu rotundato, segmento postico lineari-lanceolato, subfalcato, antico lato patente ad apicem frontem et tergum versus contorto; labellum tripartitum, lobo medio angusto lineari-filiformi verrucis 3 subinflatis instructo, lateralibus latissimis patentibus falcatis leviter incurvis; nectarium extrorsum curvatum ovario sublongius. *Stigma* quam in *B. speciosa* brevius, carnosum, supra subextrorsum lateraliterque canaliculatum.

Hab. Bedford, in damp hollows on banks near watercourses. August and September.

This flower resembles a white Lepidopter, such as *Pieris* or *Anthocharis*, and might truly be called the Butterfly Orchis of South Africa.

The posterior portion of the petals is tinged with greenish; the rostellum and anthers are also yellowish green; the sepals are bright green, and the labellum and anterior portion of the petals pure snow-white.

It is nearly allied to both *Bonatea speciosa* and *Habenaria* (? *Bonatea*) *Saundersiæ*, Harv., to which last it is most closely connected, although differing in the very important point of its petals being divided. It is also, in some respects, allied to *B. Boltoni*, Harv.

I have for some years been busy examining the fertilization of Orchids and Asclepiads in South Africa, but, owing to various reasons, I have been unable to prosecute their study with the uninterrupted attention which is so desirable for a complete and satis-

factory elucidation of the curious facts connected with the agency of insects. I regret that on no occasion have I possessed the plants in a cultivated state, so as to subject them to direct experimentation with the object of testing under a variety of circumstances the causes of the great fertility and infertility of different species. Thus *Disa cornuta*, although very abundant, and producing an enormous number of conspicuous flowers in the neighbourhood of Port Elizabeth, only occasionally bears fertile seeds. In October or November, 1863, my friend Mr. R. I. Miller, of Port Elizabeth, obtained for me a spike of *Bonatea speciosa*. This plant was growing on the sand-ridge to the left of the village of Walmer, and, so far as I am aware, is confined to that neighbourhood at Algoa Bay.

Having read the interesting notices of this aberrant and most curious form in Mr. Darwin's celebrated work 'On the various Contrivances by which British and Foreign Orchids are fertilized by Insects,' published in 1862, I dissected several of the flowers, and made drawings under the microscope with the camera lucida.

But, last year (1865), in the Journal of the Linnean Society, vol. ix. No. 35, I found a paper "On the Structure of *Bonatea speciosa*, Linn., with reference to its Fertilization," by Roland Trimen, Memb. Ent. Soc. London, and the well-known author of "Rhopalocera Africæ Australis;" and this again drew my attention to the subject.

In the spring of 1865, near the Koonap River, I caught several specimens of the smaller variety of *Pieris gidica*, and likewise of *P. charina*, with pollinia of some unknown species of Orchid loosely attached to the sternum.

In the present year I captured, towards the end of August, a specimen of ?*Anthocharis Antigone*, which appeared to have some difficulty in flying. On first observing it I imagined that the yellow variety of the female *Thomisus* (? *abbreviatus*, Walck.), Order *Araneida*, had seized this beautiful insect as its prey; but whilst squeezing it in the net, I perceived that unfortunately a pair of pollinia belonging to some orchid had become dislodged from its sternum.

On searching the neighbourhood I found that, together with the hitherto unknown habitat of *Antigone*, I had discovered a new and interesting species of *Bonatea*, which I believe to be as yet undescribed.

The plants were growing on a low bank in a sloping gully amongst a few dried up ferns. Their tubers were barely covered

with loose leafy mould, and they appeared to suffer from the exceedingly dry weather which had so long prevailed.

On the bank were several specimens, most of which had not then blossomed. Those which had were, in almost every instance, deprived of their pollen masses, and the thick creamy layer of pollen on their projecting stigmatic surfaces showed how attractive their conspicuous blossoms were to insects.

The plant was afterwards found growing in abundance on similar spots all along the Bedford River.

The flowers possess no scent, and, although smaller, are much more conspicuous than those of *B. speciosa*, and evidently depend principally upon Rhopalocera for their fertilization.

In every flower examined the nectaries were full up to their mouth of a sweet viscid juice.

In this respect, in their very conspicuous colour, and in the absence of scent they appeared to differ from *speciosa*, Mr. Trimen's remarks on the absence of nectar being confirmed by my own observation.

From this date down to the middle of September this plant was found growing in abundance; and the ovaries of withered plants in every case appeared swollen with seed.

The tiny, but robust, little Skipper Butterfly, *Pyrgus Elmo*, was discovered one morning perfectly embarrassed from the number of pollinia attached to its sternum. Owing to the close contiguity of the masses, and the fact that many of the caudicles are entirely bereft of their pollen, so that merely a fragment with the viscid disk remains attached, I am uncertain as to the number, but believe that from 9–12 remain on my specimen.

I propose in this paper to compare this species with others observed or described by other authors, and from which I believe it to differ in slight details, the adaptation in this genus being apparently very closely connected by a fine series of South-African plants.

Of *Bonatea Saundersiæ* Harvey remarks in vol. ii. fol. 29 of the 'Thesaurus Capensis':—

"Of this very distinct species I have seen but a single specimen, collected by Mrs. Saunders, and given by her sister, Miss Wheelwright, to the Dublin Herbarium. It is quite unlike any South-African species, but seems allied to *H.* (*Bonatea*) *gracilis*, Lind., from Peninsular India."

The Bedford *Bonatea* appears to be very closely allied to this interesting Orchid, and to form a connecting link between it and

Bonatea speciosa, to which also in many of its characters it bears a close relation.

Like *speciosa* and *Boltoni*, its anterior petals are divided, the posterior portions being relatively of larger proportions. In this respect it differs from *Saundersiæ*, whose petals are undivided, but resembles it in the broad and conspicuous laminæ of the anterior portions. Relatively to the breadth of the anterior portions, the posterior are narrower than in *speciosa*.

Its anterior sepals are partially like those of both these plants. Like those of *speciosa*, they are deeply and complicately cleft and falcate, and are united to the labellum with the petals; but, unlike them, they lie in a plane almost at right angles to the anterior petals, and cross their blades behind in a direction almost parallel to the lateral processes of the labellum. Like those of *Saundersiæ* they are decumbent, and show the slightest imaginable inclination to turn upwards at their extremities like those of *speciosa*.

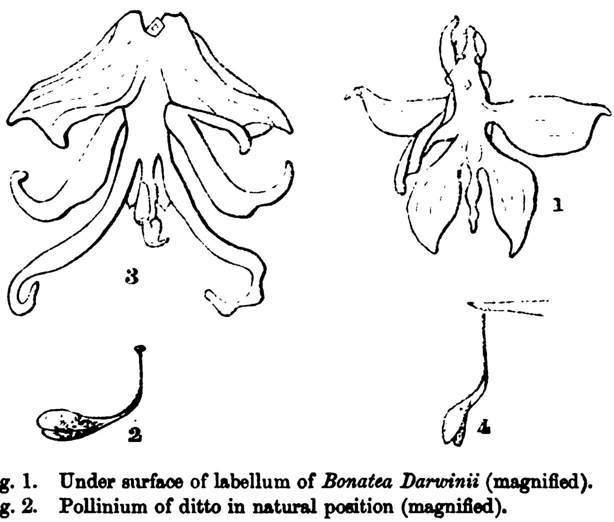


Fig. 1. Under surface of labellum of *Bonatea Darwinii* (magnified).
Fig. 2. Pollinium of ditto in natural position (magnified).
Fig. 3. Under surface of labellum of *Bonatea speciosa* (from Mr. Trimen).
Fig. 4. Pollinium of ditto (from Mr. Trimen).

The lateral processes of the labellum are even broader than those of *Saundersiæ*, but not so incurvedly falcate, and the medial process is shorter than the lateral, in which respect it differs from *Saundersiæ*, but more nearly resembles *speciosa*.

This shortening of the centre process is due to very different contrivances in the two plants.

In *speciosa* the shortness is produced by three folds inwardly, whilst in this species there are three broad and thick expansions or swellings occupying a position corresponding to the folds in *speciosa*. In *Saundersiæ* the folds are represented by three lax curvatures.

The position of the stigmatic surfaces is also distinct in each. In *speciosa* they project forward beyond the junction of the three lobes of the labellum. In the Bedford species, whilst they are free at their extremities as in *speciosa*, they barely reach so far forward, but in the same direction project forward and outwards. In *Saundersiæ* they appear to be attached to the exterior margin of the lateral processes of the labellum, and are curved at their extremity outwards; but, owing to the inexactitude of the drawing, according to Harvey, too much dependence cannot be placed on their exact form and position.

The posterior sepal, the anther, and the helmet of the rostellum are thrown back at a more considerable angle than in *speciosa*, or even further than in *Saundersiæ*, and its hood is even relatively more expanded than in *speciosa*. This is occasioned by, or is correlative with, the abrupt and almost perpendicular angle which the caudicle of the pollinia forms with the pollen masses.

These last are twisted inwardly and outwardly, so that the viscid disks lie in a more abrupt, but nearly corresponding, plane with the stigmatic processes. While in *speciosa*, after removal, the caudicles become straighter, in the Bedford *Bonatea* they become, if anything, more incurved.

Mr. Trimen was the first to draw attention to the very peculiar peg which is inserted at the mouth of the nectary of *speciosa*. This peg I had already observed in 1863, and at that time made several drawings under the microscope.

In the Bedford species this peg assumes the form of a cup-like lip and is relatively much smaller, while the mouth of the nectary, on the other hand, is by no means so constricted as in *speciosa*.

It appears to me that these parts answer the same purpose in different ways in the two plants.

In the flower of *B. speciosa* the constricted mouth and the peg oblige the nocturnal insects attracted by the strong scent of this flower (which much resembles that of *Hesperanthus* and a species of *Satyrium*, both plants growing in the vicinity) to remain

some time probing its empty nectary; for my observations in this respect agree with Mr. Trimen's. I found no free nectar in the nectary, although, if I remember rightly, the substance of the nectary was sweetly juicy when sliced open.

In the Bedford species the nectary is generally full of nectar up to the brim, while the flower on the contrary is scentless.

In both plants the viscid matter on the disk hardens slowly, and hence it may be a matter of some importance that an insect visiting a flower should be delayed. In the one case the cheat would probably be quickly detected, whilst, in the other, the abundance of nectar would probably soon satisfy a visitor. I may state here that, so far as my observations go, most of the scented dull-coloured *Iridaceæ* and *Orchideæ* have a great similarity of perfume, and that, whilst the former are very numerous in individuals, the latter are sparsely scattered about.

In *B. speciosa* it is of the utmost importance that the viscid disks should be fixed laterally and backwardly on the head or thorax of the visiting insect; for otherwise the straightened pollinia would have little chance of touching the elongated stigmatic processes.

In the Bedford species the pollen masses were in both instances attached to nearly the centre of the sternum, and easily came in contact with the spatelliform processes, which are relatively much shorter than in *speciosa*.

In the only specimen of *speciosa* which I examined, the pollinia were unremoved in the three flowers which were expanded.

In *Boltoni* the stigmatic surfaces are much inclined upwards, and the anterior portions of the petals project upwards as guides to the insects visiting the flowers.

In *speciosa* both the sepals and petals curve upwards, but in a less marked manner than in *Boltoni*; and, to the best of my recollection (but of this I am uncertain), the stigmatic processes in the full-blown flower have likewise an upward tendency.

In the Bedford species this tendency is only evinced by a slight and insignificant twist at the straightened apices af the anterior petals; and in *Saundersiæ* both sepals and petals are markedly decumbent, the apices being curved, indeed, but very slightly, and in no way upwards.

It will be remarked that I only knew of one spot near Port Elizabeth where *speciosa* could be found; and there it is said to grow but sparsely.

The species at Bedford was numerous; and in almost every case

the many open flowers were thickly fertilized, as though each flower had been constantly visited.

In both the Bedford species and *Saundersiæ* the nectary projects forwards, whilst in *speciosa* it is projected vertically downwards, and in *Boltoni* it is curved inwards (? slightly).

In all, the position of the nectary appears to lie in a plane drawn from the enclosed pollinia downwards.

The hood of the rostellum in *Saundersiæ* presents a marked contrast to the Bedford species in its diminished and almost rudimentary condition.

These notes, I fear, are very imperfect, owing to the scanty drawings I have had an opportunity of examining, and I regret that I am utterly unacquainted with *Bonatea gracilis*, Lindl.

If the species here noted has not as yet been described, I propose the specific name of *Darwinii*, in honour of the naturalist from whose works I have derived so much incitement to prosecute the study of living beings.

Notes on *Jussiæa*. By Mr. Charles Wright. Communicated by Dr. Hooker.

[Read May 7, 1868.]

I never so much appreciated the value of seeds for specific characters as in my attempts to distinguish the true names of the Cuban *Jussæiæ* from the synonymy which accompanies them. A glance at this shows that there is something wrong—that many species have been established on insufficient data. In the infancy of the science, the known species were few, and could be well characterized by the habit, flowers, fruit, &c. But at present marks of distinction less variable should be sought, and I have been surprised to observe how rarely the number, form, or arrangement of the seeds is noticed; yet they give most excellent characters.

In the species examined, there are two principal modes in which the ovules are arranged in the ovary-cells—uniserial and pluriserial, or crowded. I find, in Kunth, three good analytical figures, of which I shall make use in the following observations.

I have determined, more or less satisfactorily to myself, the following as Cuban *Jussiææ*. *J. repens*, L., *J. peduncularis*, Wr., *J. oocarpa*, Wr., *J. pilosa*, Kth., *J. acuminata*, Sw.?, *J. inclinata*, L., *J. hirta*, Vahl, *J. decurrens* and *J. suffruticosa*, L.?

It would seem that I have not met good fruit of *J. repens*, or have neglected to collect it. I suppose my flowering specimens from Cuba are correctly referred to it.

J. peduncularis, Wr. This is a very peculiar plant in more than one respect. It grows principally on what are called in Cuba "*tembladeras*"—accumulated masses of decaying vegetable matter, buoyed up by the spongy roots of the plants growing on them, and floating from side to side of the pond, or often stationary, being more or less attached to the bottom of it. It grows to the height of several feet, and becomes somewhat woody at base.

But the seeds are what I particularly aim to describe. The ovules are suspended in a single series in the ovary-cells. In their process to maturity, each one is enveloped in a portion of the endocarp, of definite size and shape, which quite encloses the seed and becomes woody. These seeds, as they would at first sight be called, are trigonal, or the exterior portion rounded, truncate at the ends, and fitting to one another as if they had thus been divided with a knife. The seed is found within, enclosed within its proper testa. Embryo clavate, cotyledons twice as long as the radicle. Sometimes one of these portions is found longer than the rest, as if it might contain two seeds. In this case I observe that the seed is at one end; and probably the other ovule becoming abortive, this portion adheres to the one in which the seed was perfected. The raphe of the seed is towards the capsule-valve.

J. oocarpa is so much like the former, that it can be described in fewer words. This is found *only* on the *tembladeras*. The fruit is short, often so much so as to resemble the eggs of some tortoises. The general arrangement of the seed is as in the preceding. Their woody envelope is not so firm, and is itself enclosed in a soft stratum of the endocarp. The external angles are more rounded, and the cotyledonar end is quite closed, while the opposite one is open and bevelled off on the outer side. Within this lies the seed, enclosed in its membranaceous testa, with short clavate semiterete cotyledons three times the length of the radicle and of greater diameter.

J. pilosa, Kth. According to Mr. Grisebach this is *J. variabilis*, Meyer (2565, Wr.). It may be so. It is certainly *J. foliosa*, Wr., and *J. leptocarpa*, Nutt. The seeds are uniserial in the ovary-cells, neither ascending nor suspended. The ovules are at first, apparently, quite free and contiguous; but shortly

before maturity a corky envelope of definite shape and size curves round each ovule separately, in the manner of a horse-shoe, but leaving it exposed above and below, and lying transversely to the axis of the fruit. The seed is easily separated, and is found with its proper testa. Embryo elliptic, the two cotyledons together just as large and as long as the radicle. The figure in Kunth is admirable.

J. acuminata, Sw. sec. Grisebach. This has a remarkable peculiarity of structure. In the lower part of the ovary (more than half generally) the ovules are in a single series; in the upper part in more series than one. Even in the young ovary, before flowering, it is clearly perceptible that the upper portion is larger than the lower, thus indicating a difference of structure. As the fruit approaches maturity, the lower uniserial seeds become enclosed each in its definite portion of endocarp, which remains of a spongy consistence and opens outward by a fissure as definite and as neat as if made by the most consummate art, and the envelope opens like the two sides of a bullet-mould when the time comes for the escape of the seed. But in the upper part of the capsule nothing of this is seen; the seeds lie loosely together in the cells. In this part the ovules, too, are slightly ascending, and suspended in the lower.

To this belongs no. 2551, *J. micrantha*, Kze. sec. Grisebach, young plants. Also "*J. acuminata*, no. 998, Gardner, 1838, Pernambuco." *Aso*, a plant gathered on the "Niger, W. Trop. Africa, by Dr. W. B. Baikie, received April 1865," but without name or number.

J. inclinata, L.? According to my experience, this is a floating plant, never rooting in the soil willingly. Observing the inflated stem, I suggested the name *inflata*. Mr. Grisebach puts it as a var. of *J. repens*, just because he did not look inside the fruit. Ovary 4-celled. Ovules innumerable, neither ascending nor suspended. Seeds unenclosed in any portion of the endocarp, elliptic; radicle as long as the two cotyledons united.

J. hirta, Vahl, much resembles the last in the structure of the ovary, but the ovules are ascending. This is well figured by Kunth.

No. 2559, ann. 1860–1864, was returned by Mr. Grisebach as *J. acuminata*, Sw., but it is very distinct from no. 2560. The ovary is 4-celled, and the ovules numerous, very closely imbricate, and ascending. The seeds are elliptic or oblong, slightly curved, the raphe on the concave side. It is the *Jussiæa decurrens*

of the United States, and very probably *Jussiæa ramosa*, Jacq., figured in Reich. Hort. Bot. cent. 1 to 75. We know not the date of the latter name, or whether it is earlier or later than *Ludwigia decurrens*, Walt.

We come now to one that has so many names that it does not know half of them. It is certainly *J. salicifolia*, Kth., as the seeds clearly show. These are said to be *bilocular*. But the empty cell can be dispensed with, by calling it an enlarged raphe. Perhaps this opinion will be confirmed by knowing that it is full of raphides. It is easily separable from the true seed. Something similar is seen in *Potentilla paradoxa*. In this species of *Jussiæa* the ovules are ascending, in three or four series. In the ripe fruit the seeds lie quite loose, and are very numerous and unenclosed in any part of the endocarp. There is a little groove on each side between itself and the raphe.

Here belong:—the Cuban specimens numbered 159, ann. 1856–1857 and 1859–1860, var. *palustris*, 2556, ann. 1860–1864, "Fendl. 115;" "*J. octonervia*, Spruce, 2413, San Gabriel da Cocheira ad Rio Negro, Bras. Bor. Jan.–Aug. 1852;" "No. 2227, coll. G. Mann, W. Trop. Africa;" "*J. exaltata*, Roxb., Griffith, Malacca, 18;" "*J. octofila*, DC., C. Wr., no. 83, Loo-Choo Islands;" "Herb. Ind. Or. Hook. f. et Thomps.," and "*J. angustifolia*, Lam. Herb. Ind. Or. Hook. f. et Thomps.;" "No. 2228, Herb. late East India Comp.:" some of the seeds have the inflated raphe, others not, perhaps immature. A specimen from Pondicherry, by Perollet, has the same seeds, and foliage within the limits of variability. Mann and Bigham, no. 66, Oahu, is the same, also "*Juss. octofila*, DC., from Peru, in Herb. Gray, distributed by the Smiths. Inst. from the Herb. U. S. Pacif. Expl. Exp. 1838–1842;" item, a "plant collected by Wright on the Rio Grande in 1848." A specimen from Grisebach, marked *J. occidentalis*, erased, and underneath, in the donor's handwriting, *J. suffruticosa*, is also Kunth's *J. salicifolia*. This may seem like heterodoxy on a "stampede." I do not ask any one to believe as I do; but please examine, and do not trust so much to hairs and leaves.

The distressing embarrassment I have so often felt when, having before me a plant which I could not doubt ought to be described in the book to which I referred, I was yet quite unable to satisfy myself which it was, has led me to the careful and conscientious examination of the above-named plants. The order merits a thorough revision.

Some species of *Passiflora*, too, have been equally embarrassing—the foliage, on which too much reliance has been placed, being inordinately variable, even in the same individual plant. I have lately carefully examined the Cuban species called *P. minima*, *hederacea*, *pallida*, *angustifolia*, *suberosa*, &c., and come to this conclusion:—*P. pallida*, L., is an old and appropriate name, to which belong *P. minima*, L., and *P. angustifolia*, Sw., certainly; *P. hederacea*, Cav., *P. suberosa*, L., probably; and, from the description, I judge *P.leariloba*, Hook. f., to be only another form of it.

N.B. *P. multiflora*, L., must be removed from *Cicca*, having good petals, though nearly invisible in the dried specimen.

Notulæ Capenses. By P. MAC OWAN, B.A., Shaw College, Grahamstown. Communicated by Dr. HOOKER, V.P.L.S.

[Read May 7, 1868.]

THE late Dr. W. H. Harvey, during a correspondence of five years' duration with the author of the following paper, was accustomed to lay aside for further examination such dubious or new collections as did not belong to orders already elaborated or in progress for his memorable work the 'Flora Capensis.' Sometimes the affinities were indicated, sometimes a provisional name was appended. Partly from these hints have arisen the brief notes I have here offered in homage to his memory.

SENECIO SURCULOSUS, n. sp. (§ Rigidi?). Suffruticosus, glaberrimus, ramis plurimis surculoideis in ramulos floriferos sursum nudos decompositis, foliis lanceolatis basi longe attenuatis plicatis subcarnosis supra medium dentatis, superioribus minoribus integris, corymbis laxis subpaniculatis, squamis involucr. 12 disco brevioribus, bracteolis minimis paucis, floribus disci 20, radiis 5 angustis, acheniis hispidulis.

Hab. Stony bushy slopes near Grahamstown, alt. 2000 ft. Nov.–Febr. (No. 594, coll. auct. ann. 1867–1868.)

Descr. A bush, 2–3 ft. high, divided at the base into many glabrous, erect, half-herbaceous branches, which separate above into several ultimately nude, floriferous ramuli. Leaves lanceolate, 1½–3 in. long, 2–8 lin. wide, gradually attenuate towards the base, coarsely toothed beyond the middle, plicate, somewhat fleshy. Corymbs of about 20 heads, very lax, subpaniculate. Involucral scales 12, shorter than the disk, calycled with 4–6 minute bracteoles. Disk-flowers

about 20, rays 5, narrow. Achenes hispidulous. Habit of *S. Zeyheri*, Turcz., but branched conspicuously.

Several imperfect ramuli of this *Senecio* were received in 1864, and marked "§ *Leptophylli*, near to *S. longifolius*, L." Dr. Harvey placed a mark of doubt to this suggestion, and desired further specimens. The plant was not found again till the present summer, when it occurred in plenty, growing with *S. Zeyheri*, Turcz. Its systematic place will doubtless be near that species. Both plants are remarkable for a peculiar surculoid growth, the perennial roots sending up a multitude of erect half-herbaceous stems. This is independent of that frequent cause of such habit, the South-African custom of burning off the grass. The texture of leaf, the involucrum, and achenes also exhibit a strong mutual resemblance between the two species. The chief differentia in *S. surculosus* are the fewer and much narrower rays, lanceolate leaves, repeatedly divided growth, and more paniculate inflorescence.

In several places near Grahamstown occurs a fruticose *Senecio*, which has a certain resemblance to the half-herbaceous species characterized above. It would seem to be a very luxuriant form of *S. longifolius*, L. The common form, with "leaves terete from the strongly involute edges," as described by Harvey, is common enough. DeCandolle altogether omits this character, which, in dried specimens, may be easily overlooked. The variety to which attention is now drawn, distributed by me as no. 786, has leaves linear-lanceolate, sometimes obscurely toothed towards the apex, and plicate only instead of involute-terete. It thus approaches *S. surculosus*. On the other hand, the inflorescence and capitula are precisely those of the most typical forms of *S. longifolius*, L. Perhaps, in view of this curious form, the three species *S. longifolius*, *surculosus*, and *Zeyheri* might most naturally be grouped together under Sect. *Leptophylli*. There would then be a regular gradation from the linear leaves of the first to the sometimes rhombic-ovate, and more often shortly obovate leaves of the last.

It may not be amiss to add that Dr. Harvey's *Senecio rhomboideus*, founded on a single imperfect specimen of Ecklon's, has been refound near Grahamstown, and is certainly a good species, never varying in cultivation, as does *S. oxyriæfolius*. *S. gramineus*, Harv., unquestionably distinct from *albanensis*, not only by its villous ovaries but by a different flowering-season, has occurred both here and at Graaf Reynet, being found at the latter place by Mr. H. Bolus. To him also is due the refinding of the rare *S. cotyledonis*, DC., and *acutifolius*, DC. *Kleinia acaulis*, DC., till lately existing

probably in Thunberg's Herbarium alone, has been found abundantly on the Bothasberg within five miles of Grahamstown.

The following note to the above paper has been furnished by Professor Oliver.

[For the convenience of those who have interleaved copies of the 'Flora Capensis' it may be mentioned that at least two other new species of *Senecio* have been issued by Mr. Mac Owan since the publication of the third volume of that work, viz.:—*S. tropæolifolius*, Mac Ow., described and figured in Hooker's 'Icones Plantarum,' t. 1011, a species allied to *S. oxyriæfolius*, DC., from which it differs in its radiate capitula; and *S. cornu-cervi*, Mac Ow. They may be diagnosed as follows:—

S. TROPÆOLIFOLIUS, *Mac Ow.* Herba glaberrima, glaucescens, caule gracili basi fruticuloso; foliis carnosulis peltatis gracile petiolatis, late ovato-orbicularibus acute sinuato-angulatis; scapo stricto erecto gracili, 1–2-cephalo, bracteis minutis linearibus arcuatis instructo; involucro campanulato calyculato, squamis 10–12 anguste linearibus acuminatis marginibus tenuiter membranaceis; radii floribus ad 8, disci 10–20; achenio striato glaberrimo.

Hab. Near Grahamstown, Cape of Good Hope.

Leaves 1 in. diam., scape 8–10 in. tall. Scales of involucre ¼ in. long, equalling the disk.

(Of the following species, a description has been published by the Albany Natural History Society, 1867.)

S. CORNU-CERVI, *Mac Ow.* (§ Rigidi). Caule a basi ramoso tomentoso ramis corymbiferis; foliis oblique profundeque sinuato-pinnatisectis margine revolutis basi subauriculatis supra araneosis subtus albo-tomentosis; corymbo composito, ramis primordialibus laxis elongatis ultimis brevissimis inæqualibus, involucro glabro polyphyllo squamulis 12 araneosis suffulto; floribus disci 40–50, radiis 12 angustis; acheniis striatulis pubescentibus.

Hab. Katberg Mountains, Cape of Good Hope.

Allied to *S. juniperinus*, L.]

On the Silkworm-Oaks of Northern China. By HENRY F. HANCE, Ph.D. &c., H.B.M. Vice-Consul, Whampoa, China. Communicated by J. D. HOOKER, M.D., V.P.L.S.

[Read May 7, 1868.]

THE Commercial Report for the year 1865, by Mr. Thomas Taylor Meadows, on the Consular District of Newchwang, the most northerly of the ports of China opened to foreign trade by the

Treaty of Tien-tsing, and situated in the Manchurian province of Tung-t'ien or Shêng-king *, contains some interesting details, derived from personal investigation, regarding "mountain silk," the product of the larvæ of a moth feeding on oak-leaves, and which has of late attracted some attention in Europe †. Blue-books are so seldom a favourite class of literature with students of natural science, that it is unlikely many who hear this paper will have met with the able Report above referred to ‡, from which, therefore, I think it may be worth while to make the following extracts :—

"There are two crops of the mountain cocoon, a 'chun' or spring crop, and a 'tsew' or autumn crop. The latter is collected in the last half of September and in October, and the cocoons are brought to market during this latter month. At this period the silk-growers pick out the best of the cocoons for the production in spring of the butterfly and worm for the spring crop. They are preserved in baskets, which are hung up in the Chinese dwelling-rooms. These almost always face the south, thus opposing a blank back wall to the cold northerly winds prevalent in winter, and getting from their southerly windows the full advantage of the sun in that season, when, during nine days out of ten, there is a clear blue sky. Besides this, the dwelling-rooms are partially heated by the warmth emanating from the surface of the kang, a brick bench which occupies about one-third of the room, which serves as a sleeping-place at night, as seat, &c., during the day, and inside which is a winding flue, with an aperture at one end, in which a fire of millet-stalks is occa-

* In the map of the Russian Empire which accompanies Ledebour's 'Flora Rossica,' Schinking is given as a synonym of Manchuria, and embraces the territories known to geographers as Kirin and Tsitsihar, with the part of Inner Mongolia situated to the east of the Soyortai mountains.

† Mr. W. H. Lay, in his Report on the trade of Chefoo for the year 1865, thus refers to what, I suppose, is the same production. "Amongst the articles that can be exported from Chefoo, there is brown silk produced from the wild silkworms that swarm in the mountain-forests; and the quantity of this article that could be brought into the market, if prices suited, may be computed at not less than 12,000 bales a year. This silk is of different qualities, according to the process and care adopted in reeling it from the cocoons; and some of it is well adapted for manufactures. The natives weave plain silk goods from it, called "pongees," and about 100,000 pieces of these stuffs could be bought annually."

‡ Those who desire to refer to it will find it printed *in extenso* in the 'Commercial Reports from H.M. Consuls in China and Japan, 1865,' Lond. 1866.

sionally lighted. In spite of all this, however, the temperature of a Chinese dwelling in the mountain-silk district is during the greater part of the winter considerably below the freezing-point. The worm, being indigenous, could doubtless stand the cold of the winter's night in its cocoon on the bushes on which it forms these latter; but, apart from theft, destruction by wild animals, insects, &c., it is probable that in nights of unusual severity only the strongest and best enclosed might escape perishing from cold.

"The natural heat of spring suffices to bring the chrysalis out of the cocoon in the butterfly shape. The butterflies then couple, and in about four or five days after impregnation the female lays eggs. They are laid on native paper spread on mats, tables, &c. In about five or six days, from each of these eggs is produced a small worm of about the size of a black ant, and which is black in colour. This is about the time when the buds on the oak bushes have begun to make their appearance. This must be in the last half of April. The young leaves are forced, by twigs being cut off from the bushes and placed in water—in pools of the mountain-streams, or in tubs in houses. From these the young tender leaves are taken, and are scattered over the paper, as the worms appear from the eggs. The worms are thus nourished for some days, when they are transferred to the youngest, most tender-leaved oak bushes on the hill-slopes. They are then about an inch in length, but are still black in colour. The transfer of the whole does not take place in one or two days. There is during the whole existence of the animal in its worm stage a difference of eight or ten days in the backwardness or forwardness of individuals. After some days the worm has its first sleep or torpor, at the close of which it changes its skin, and reappears green in colour and larger in size. It has, in all, four of these sleeps or torpors, each of which lasts about two days. It changes its skin, and becomes larger after each torpor, but retains after the first the same bright green colour. For its next, or fifth sleep, it prepares by spinning itself into a cocoon, in which it assumes the chrysalis shape, then bursts out as a butterfly and lays eggs, from which the small black worms are produced, when the processes just described are gone through again. These processes are, in the spring season, more rapidly performed than the similar processes in the autumn. The silk-growers told me that those of spring required about 60 days, those of autumn about 100. In each season, as fast as the worms consume the leaves on one bush, they are removed by the

attendant silk-cultivators to another, the youngest bushes being used first.

"The worm is fed on three kinds of oak bushes, called *small* '*tsing-kang-lew*,' *large* '*tsing-kang-lew*,' and '*hoo-pŏ-lŏ*.' The only difference between the small and the large *tsing-kang-lew* seemed to me to lie in the acorn-cup, that of the former being smaller and also smoother outside than that of the latter. As for the *hoo-pŏ-lŏ* oak, its leaves are much larger and darker than those of the large or small *tsing-kang-lew*. Its acorns are also much larger, and, what at once marks the difference, the cup, instead of a hard exterior, rendered more or less rough by small, hard protuberances, is covered with longish feathery filaments, which give the cup the appearance of a small fur cap.

"The yield of the spring crop is said to be much less than that of the autumn crop, 1000 cocoons of the former giving no more than 500 of the latter. But the quality is said to be greatly superior—finer, whiter in itself, and more capable of taking dyes; but black, with various shades of reddish brown or purple, seem to be the only dyes that either kind will take.

"The chrysalids which are not kept for breeding are used by the Chinese as an article of food.

"The mountain silk remains as yet the one article which this district is likely to furnish to England. My explorations of last summer convinced me that I did not, in my last Report, overestimate the extent of country in which it is produced when I said 150 miles by 100. On the other hand, instead of saying that 'not one-fourth part of the hill-sides' suitable for the oak bushes is planted with them, I should now say that not one-tenth part is so planted. Viewing the nature of the article and the quantities that are now and that could be furnished, the trade could be developed into one of appreciable importance even for our great manufacturing interests, unless exactions and jealousies of the local mandarins interposed to repress it."

Being desirous of ascertaining the particular species of oaks on which this sericiferous larva feeds, I, in July 1867, invited, through the medium of 'Notes and Queries on China and Japan,' a very useful periodical published at Hongkong, any gentleman who might be willing and able to assist in the inquiry, to communicate specimens of the foliage and fruit.

My invitation was most kindly responded to by Mr. E. C. Taintor, an American gentleman in the service of the Chinese Imperial Customs, who, in December last, sent me specimens, the

leaves nearly all gathered separately, but well dried, packed up carefully, and labelled to correspond with the acorns, accompanied by the following memorandum:—

"The number of 'Notes and Queries' which contained your request for leaves I found awaiting me, on my return about the middle of August from a short trip into the country, about 20 miles east from Newchwang, on which trip I had noticed, in a pleasant little valley, quite a number of oak shrubs, with the acorns still green, but of full size. Being on horseback, however, I did not gather any of them. After seeing your note, I endeavoured to obtain some of the leaves, in accordance with your request, but was unable to do so until the 11th of October, on my return from a visit to Moukden. The locality is the Ts'ien shan or Thousand Mountains, which enclose a magnificent valley about 60 miles south of Moukden, and 70 north-east of Newchwang. Many of the leaves, as you will observe, had already turned brown; and as my time was limited, I was obliged to take such as I could find. The silk-culture is not carried on so far north as this, the silk-producing district lying, as stated by Mr. Meadows, to the south-east of Newchwang; but I was assured by the priests that the leaves marked 1 and 3 are identical with those used for the above purpose further south.

"The leaves marked 1 are those of the '*siao-yeh tso-shu,*' or small-leaved oak, and are used for feeding the large silk-worms. A package of acorns bears the same number, as also a small branch of the wood. This species was quite abundant, and varied from a bush 3 or 4 feet in height to a tree of 15 or 20 feet*.

"The leaves marked 2 are those of the '*ta-yeh tso-shu,*'' or large-leaved oak, which, as I was told, are not used for feeding the silkworm. The under surface of the leaves and the young bark were covered, to a greater or less extent, with a downy pubescence, still observable on some of the former. The cup of the acorn is very noticeable. This species was the most abundant, in many places covering the mountain-sides, and appeared mostly in the form of a bush 3 or 4 feet in height, with occasionally one of 8 or 10 feet.

"On my ascent of one of the mountain-peaks, I picked two or three leaves (marked 3), which attracted my attention as being

* According to Regel (Tent. Fl. Ussur. 130), it attains a height of 40 feet in Russian Manchuria.

more sharp-pointed than any I had noticed, and intended on my return to gather more, but could not find the tree again. It was the only one of the kind that I saw; and no acorns were to be found on or under the tree. These leaves also are, according to my informant, used to feed the silk-worm. The same name was given to the tree as to No. 1; but the pointed leaf was so characteristic that it seemed to me to be a distinct species."

The first species alluded to in this note is no doubt referable to *Quercus mongolica*, Fisch., a tree which, according to Maximowicz*, extends northwards to Albasin, at the mouth of the Amur, in 53° 10′ N. lat., and has been traced thence in a westerly direction to Nerczinskoi Sawod, on the Argun, the eastern limit of the Government of Irkutsk, in about 120° E. longitude. I have, indeed, seen no authentically named specimens of this; but those of Mr. Taintor accord so precisely with the diagnoses of Turczaninow †, Ruprecht ‡, Carruthers §, and A. De Candolle ||, that there can, I think, be no question of their identity. A. De Candolle's description of the cupule (which is sericeous inside) as having "squamas imbricatas, adpressas, dorso convexas," is very accurate, much more so than that of Regel and Carruthers, as being "squamis gibbosis muricata:" there is no murication, or squarrose spreading of the scales; nor do I find the upper ones "apice truncatas" as De Candolle describes them, but, rather (though "cupulam non excedentes," in the words of Carruthers) like the lower ones, acuminate from a broad ovate base. As I believe the *hilum carpicum* in oaks to afford useful characters, hitherto almost entirely neglected, I may add that in this species it is circular, convex, slightly elevated, and constricted by a defined ring, concolorous or paler than the glans, and a good deal rugulosely fissured. And, since I learn from Prof. Oliver that Prof. Œrsted has recently published a dissertation on the classification of oaks, in which he lays much stress on the form of style and stigma, it may not be useless to observe that the style is very short and thick, tomentose, like the summit of the glans, which is often depressed, and that the three stigmas are spathulate at the apex, with their edges cucullate, or almost plicate, joining at the base. The leaves are shining above, opaque and glaucescent beneath, and, when

* Prim. Fl. Amur. 390, and map appended to work.

† Flor. Baic.-Dahur. ii. 136.

‡ Der erste botan. Nachtrag üb. d. Amurland, 432.

§ Linn. Journ. Bot. vi. p. 32.

|| Prodr. Syst. Reg. Veg. xvi. sect. ii. 14.

young, dotted with short white hairs: the full-grown ones have also usually a few long weak hairs along the costa and primary veins; but these are scarcely to be noticed without a lens. I believe my *Q. Fabri* to be the nearest ally of this species, though abundantly distinct.

The specimens of No. 2 belong to *Q. dentata*, Thunbg. M. De Candolle* hesitates to acknowledge the identity of Bunge's *Q. obovata*, asserted independently by Miquel† and myself‡, since the former author makes no mention of the fruit; the precise agreement, however, of the cups and acorns in a Japanese specimen from Mr. J. G. Veitch with those of the Chinese plants enables me to affirm positively that they are conspecific. With regard to M. De Candolle's remarks on the floral structure, I find in the only specimen in blossom in my possession (a Yokuhama one, from the herbarium of the Petersburg Botanic Garden) that the male amenta are naked at the base, then interruptedly lax and gradually dense-flowered towards the apex, the flowers quite destitute of bracts, and the large anthers borne on filaments about as long as themselves. In this species, as in *Q. Championi*, Bth. §, the stellate hairs on the underside of the leaves spring from a yellow glandular base. The cup has the lower scales appressed, thickened, ovate, and acute; they become gradually longer and more squarrose, the upper and inner ones being very numerous, 9 to 10 lines long, subulate, at first erect, and then more or less, often strongly reflexed, like the involucral squamæ of a Teasel, surmounting the acorn somewhat, which, however, is twice as long as the cup proper; all are flat, canescently sericeous outside, of a deep bright brown inside, thinner and paler towards the margins, like the paleæ of many Polystichoid *Aspidia*, scarious and stiffish in texture, like the involucral bracts of a *Helichrysum*. The cupule is tomentose inside, 4–5 lines across, and of equal depth, with the margin erose, to which the deeper-coloured free scales form an external fringe, rising straight up for a height of 4–6 lines. The glans is perfectly glabrous, of a testaceous or alutaceous brown (nearest to the ochre-yellow, No. 73, of Syme's edition of Werner's nomenclature of colours), ovoid (not subglobose as described by Bunge ||), with an almost flat concolorous

* *Op. cit.* p. 13.

† Ann. Mus. Lugd.-Bat. i. 105.

‡ Ann. Sc. nat. 4e sér. v. 243.

§ Seemann, Bot. Voy. Herald, t. 90; Hance, in Seem. Journ. Bot. i. 180.

|| Enum. Pl. Chin. Bor. p. 62.

carpical hilum marked inside its periphery by a circle of numerous slight depressions, looking as if caused by its being stretched and pricked with a needle. The style is very remarkable; it is stout, and attains a length of 2 lines or rather more, and is dilated at the summit into a distinct cup, densely woolly outside, which I can only compare to the *indusium* of *Goodeniaceæ*, inside which the dark-coloured spathulate stigmata, three to five in number, project. The cotyledons are plano-convex and entire. Altogether, the fruit has a certain resemblance to *Q. cerris*, L.*, though both in that and *Q. pseudo-suber*, Santi, I find the cup-scales much more rigid and solid, and triangular in section instead of flat. Still, I think it not improbable that its true affinity is rather in this direction, notwithstanding that its fruit is described, apparently correctly, as annual in ripening. The extreme closeness of *Q. suber*, L., and *Q. occidentalis*, J. Gay †, which M. De Candolle regards ‡ as "species physiologicæ potius quam morphologicæ," seems to indicate that this character is of very slight value. *Q. macranthera*, F. & M., which Blume § says is scarcely distinct, is described by A. De Candolle as having a broader cup, the scales of which are said not to overtop it, with an acorn twice the length. From the written diagnosis given, Thunberg's species would fall into the section *Elacobalanus* of Endlicher and Gay ||, and perhaps amongst the *Mesolepidia* of Kotschy ¶. The shrub must be handsome when growing, as the leaves, one of which in my possession measures 13 inches in length, seem to turn of a fine purple-red in autumn. It will be noticed that Mr. Taintor was told that this oak is not used for feeding the silkworm; but, as it possesses all the distinctive characters assigned by Mr. Meadows to his *hoo-pŏ-lŏ*, viz. the larger darker leaves, larger acorns, and cup covered with longish feathery filaments, I suspect they are identical.

Mr. Taintor's supposed third species is represented by two leaves only. These are slightly narrower, oblong rather than obovate, and less broad-pointed than the others of *Q. mongolica*; but I can see no other difference, except that the short white hairs

* Kotschy, Die Eichen Europa's, t. 20 (*Q. austriaca*).

† Kotschy, *op. cit.*, t. 33 (*Q. suber*).

‡ *Op. cit.* p. 44.

§ Mus. Lugd.-Bat. i. 298.

|| Endlicher, Gen. Plant. Suppl. iv. pt. 2. p. 24; J. Gay, in Ann. Sc. Nat. 4e sér. vi. 240.

¶ *Op. cit.* Einleit.

on the under surface are somewhat more conspicuous under a lens. I do not at all think they come from a distinct plant; and the form of leaf in the genus is avowedly very liable to variation*.

I avail myself of the opportunity, as I am writing on oaks, to mention that I find the resinous juice I first noticed † as abounding in my *Q. Irwinii*, and which I regarded as corroborative of the affinity of *Corylaceæ* and *Juglandaceæ*, to be present in *Q. Teijsmanni*, Bl., and in an undetermined species in my herbarium from Penang.

Apart from the interest attaching to the scientific determination of a plant of any considerable economical utility, the identification I have been able to arrive at, through the enlightened interest in science shown by Mr. Taintor, of the ordinary silkworm-oak as *Q. mongolica*, may, if I am not mistaken, lead to results of infinitely greater importance. The perfectly hardy constitution of the oak-silkworm is undeniably proved by the quotations above made from Mr. Meadows's Report; and since both *Q. mongolica* and *Q. dentata* belong to the *Lepidobalani*, and are closely allied not only to the common oak of northern Europe, to which, indeed, Pallas referred the former, but to the whole of the species which extend through that continent and the temperate regions of western Asia, there seems no reason whatever why this insect should not be thoroughly domesticated with us: it would probably thrive as well on *Q. robur* as on the Mongolian oak‡, and

* "La forme du limbe varie fréquemment, sur le même rameau, d'une ellipse allongée (oblongue) à la forme ovée ou obovée, avec toutes les transitions intermédiaires."—A. DC., in Ann. Sc. Nat. 4e sér. xviii. 63.

† Ann. Sc. Nat. 4e sér. xviii. 231; Seem. Journ. Bot. i. 183.

‡ I consider this assumption to be justified by the extreme—indeed, extraordinary affinity of the usually recognized species of Lepidobalanoid oaks. In illustration I may note that, of the 40 figured as species by the late Dr. Kotschy in his noble work, no less than half are reduced to the rank of varieties by M. Alph. De Candolle, who, furthermore, in his erudite and exhaustive 'Etude sur l'Espèce dans les Cupulifères,' shows an evident leaning to regard many of those now acknowledged as being rather "espèces provisoires." Dr. Hooker, again, in his interesting treatise "On three Oaks of Palestine" (Trans. Linn. Soc. xxiii. 381 *sqq.*), reduces about 27 species, so called by one or other of the ultra-analytic school of botanists, and 9 of which are admitted by M. De Candolle as distinct, to 3. Dr. Cosson confounded the South-European and Algerian *Q. pseudo-suber* with the Georgian *Q. castaneæfolia*, C. A. M., which latter has been reduced by C. Koch (and by Grisebach, Spicil. Fl. Rum. ii. 336, who adds *Q. Libani*, Oliv., kept separate by De Candolle) to *Q. vallonea*, Ky. Dr. Hooker admits *Q. castaneæfolia* as distinct from *Q. vallonea*, but is doubtful whether he should not refer to it *Q. look*, Ky., and even *Q. Libani*. He also keeps *Q. mannifera*, Lindl., distinct, whilst

should certainly in Central Europe need no protection*. The introduction of so highly important a branch of industry, promis-

De Candolle reduces it to *Q. robur*. On the other hand, Miquel declares (Ann. Mus. Lugd.-Bat. i. 104) that *Q. castaneæfolia* is not distinct from the Japanese and Manchurian *Q. serrata*, Thgb., with the Indian form of which C. Koch unites *Q. Libani*; and specimens which were by many botanists taken for the Circassian species (though considered probably different by Alph. De Candolle) were gathered in Northern China by M. Debeaux. Whilst "tantæ doctorum dissensiones" prove the intricate relationship of the species of this group, as I have above asserted, it is no wonder that they and other similar instances have largely tended to foster the heresies on the subject of species which have sprung up of late years.

* The following remarks on the climate are from Mr. Meadows's Report:—

"The result of our five years' experience of the climate may be given here.

"The following is a Table of the extreme temperatures observed. It gives information much more required by the proposing resident or traveller in new countries than mean temperatures. It shows him what extremes of heat and cold he will have to encounter at times, and for which he must be prepared or suffer severely in consequence. For mean temperatures people are rarely insufficiently prepared. The chief practical defect of the Table is, accordingly, the absence of a column showing the heat in the sunshine in summer. The observations from which it is made were all taken from Fahrenheit's thermometers suspended on the northern faces of house-walls, on which the sun never shines—therefore in the coldest and coolest places:—

Month.	Coldest.		Warmest.	
	Morning at Daybreak.	Afternoon at 2 to 4 P.M.	Morning at Daybreak.	Afternoon at 2 to 4 P.M.
January		3°	39°	
February		7	35	
March	0°	14	43	44°
April	27	41	53	50
May	41	52	65	60
June	57	70	76	68
July	62	74	79	74
August	63	73	77	85
September	41	52	73	80
October	28	42	66	71
November	7	17	52	61
December	−6	2	37	44

"The coolest months are December, January, and February. The greatest cold of a winter may occur in any of these months, but is most likely to occur in January and first half of February.

"The warmest months are June, July, and August. The greatest heat of a summer may occur in any of these months, but is most likely to occur in July and first half of August.

"The number of days in any one winter on which the thermometer stands

ing occupation and competency to thousands, is surely a worthy object for acclimatization societies, the efforts of which are too often directed to chimerical, unpromising, or futile projects—"arenas arantes."

On the Structure of the Flower in the Genus *Napoleona*, &c. By Maxwell T. Masters, M.D., F.L.S.

[Read June 18, 1868.]

The genus *Napoleona* is one that possesses much interest, on account of its peculiar structure, the history attaching to it, the differences of opinion concerning its position in the natural system, its affinities, the number of species referable to it, &c. It has in consequence attracted the attention of botanists in no ordinary degree; and among the more eminent naturalists who have studied the genus are P. de Beauvois, A. de Jussieu, Desfontaines, Sir W. Hooker, Bentham, Lindley, Decaisne, and Planchon, not to speak of others less widely known. The discrepancies in the statements and opinions of these botanists are very great: scarcely two of them describe the plant in the same way, and even the representations that have been made of specimens supposed to

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at daybreak below zero does not exceed ten; and it rarely is below zero for more than two mornings in succession. In the coldest winter afternoon it always rises above zero.

"In a cool room, with venetian blinds, the temperature does not rise above 80° except for a few hours during some twenty-five to thirty-five afternoons in each summer; and these comparatively hot days do not occur together, but are distributed, with cool intervals, in groups of three to five throughout June, July, and August. In these months the temperature always falls below 80° during the nights. In exceptionally hot summers, as in that of 1862, the thermometer may stand at daybreak at 75° to 79° for some twenty days; in cool summers it rarely stands above 70° at daybreak. As to the highest temperature of the Table, that of 85°, it has only once been attained in my library during five years; that was on the 31st July, 1862.

"All the preceding remarks refer to the climate of the port of Newchwang. The northern portions of the Consular District of Newchwang are very much colder in winter, and have shorter and cooler summers."

The mean temperature of Peking, as deduced by Kuppfer from 13 years' observations, is, spring 51°·8, summer 68°·0, autumn 50°·4, winter 29°·4. A comparison of the temperatures of various European cities, as given in Mahlmann's elaborate Tables, in the third volume of Humboldt's 'Asie Centrale' will, I believe, prove my assertion.

belong to the same species vary one from the other in a manner that is not a little embarrassing. The flowering of a plant in one of the conservatories at Kew last spring afforded me an opportunity of examining the structure of the flowers; and from this examination as well as from a comparison of herbarium specimens from various collectors, I have drawn up the following remarks, in the hope that they may serve to throw some light upon the real conformation and arrangement of the floral organs, and upon the question as to whether there exists one (variable) species or more.

As the early history of the plant, its detection by Palisot de Beauvois, the incredulity with which his statements were originally received, and other cognate matters are pretty well known, and have been often recorded in easily accessible works, it is needless to allude to them in detail now, and therefore I shall only incidentally mention such points in the history of the genus as appear to me necessary for the due comprehension of my remarks. The following statement gives approximately the dates of discovery and introduction of living or dried specimens into Europe. The original *N. imperialis* was discovered by Palisot de Beauvois in 1786. Other specimens, constituting what was called *N. Heudelotii* by Jussieu, were found by Heudelot and described by A. de Jussieu in 1844. Whitfield met with the so-called *N. Whitfieldii* in 1843. He sent home living plants, one of which produced flowers at Sion House, near London, in 1848, and others have since flowered in various establishments. The plant in cultivation at Kew, on which I shall have to comment by-and-by, was probably derived from Whitfield in the first instance. Vogel gathered what is called *N. Vogelii* (Niger Flora, p. 360) in 1841. Barter sent home specimens from Lagos in 1859; and more recently Mann forwarded from Old Calabar others, and from Fernando Po, in 1860, leaves and flowers, which are distinct in some points from those sent by any other collector. Dr. Welwitsch also discovered in Angola other specimens, of which I have only seen the fruit.

On comparing the several localities whence these specimens came, it will be seen that Heudelot's plant was found furthest to the north, in Senegambia, 10°–18° N.; next in order going towards the equator were Whitfield's, collected at Sierra Leone, in about 8° N.; Barter's, from Lagos, in about 6° N.; then Palisot's original plants, gathered at Oware, in nearly the same latitude. Vogel obtained his specimens at Cape Palmas, lat. 4°. Mann's Old-Calabar plants were gathered in nearly the same latitude, but some fifteen or more degrees to the eastward; while

Fernando Po is a few degrees nearer the equator than Old Calabar and a little to the west of the latter place. Lastly, Dr. Welwitsch met with a species in Angola, to which he has given the MS. name of *Angolensis*. These indications are of course only approximate, but they serve to show that species, or at least specimens, of this genus have been met with at various points near the coast, from Senegambia in the north, round the Gulf of Guinea and the Bight of Benin, to Fernando Po, and as far south as Angola. Whether or not the plants collected in this range all belong to one variable species, or whether there are four or five distinct forms, is a question which no one can fully answer at present, from want of sufficient information; and even if more evidence were forthcoming, each systematist would probably answer the question for himself, according to his own notions of what constitutes a species.

I propose now to give a brief account of the more salient and important features of the living plant at Kew, and then to contrast them with the corresponding points in the dried specimens from the various collectors, so far as they can be made out, and with the descriptions and figures published by the various authors who have written on this subject.

The Kew plant is a small tree with verticillate, cylindrical or slightly angular branches. Its leaves are alternate, leathery, perfectly smooth and shining, three to eight inches long, lanceolate, tapering at the base, where they are biglandular, somewhat acuminate at the apex, their venation arcuate; the leaf-stalk is thick, and not more than from a quarter to half an inch long. The flowers are borne for the most part singly in the axils of the leaves, but sometimes they come up in twos and threes, and occasionally they emerge either singly or in groups directly from the old wood, being in all cases nearly, if not quite, sessile, and surrounded at the base by three small overlapping ovate bracts, which are often glandular at the margins, and similar to those at the base of the flower-bud of a Camellia. The flower-buds are somewhat angular, inversely pyramidal, pointed at the top. Each flower is about two to three inches in diameter when fully expanded, and it consists of the following parts:—First, a bell-shaped calyx, divided about halfway down into five, ovate, acute, leathery sepals, which are valvate in æstivation: in some flowers that I examined, the sepals had near the apex, and at the margins, small glandular excrescences; but these were not always present. The corolla is rotate, five-lobed, each lobe rounded or ovate, longi-

tudinally plicate, the ribs thickened and spreading from the base like a fan. The ribs are from 6 to 7 to each lobe, and more prominent on the lower than on the upper surface; wide at the base, they gradually taper to a point; the intervening substance is membranous and much crumpled at the margins. The corolla for about three-fourths of its extent is of a rich claret-colour, while the margin is cream- or apricot-coloured. In the bud the central and larger portion of the corolla is erect, the margin, however, being infolded; while the base is somewhat bent at its insertion. As it expands, it first spreads horizontally and is afterwards bent downwards, so as completely to conceal the calyx. Between the corolla and the true stamens are two rows of organs, to which various names have been given by different authors. For the present I propose to speak of them as the corona, using that term purposely because it is vague and conveys no definite impression as to the exact morphological signification of the organs in question. The first row of the corona, then, consists of from fifty to sixty linear, or strap-shaped, sharply-pointed whitish threads (staminodes ?) tipped with pink, coherent one with another to a very slight extent at the extreme base. Their length is less than half that of the corolla; but they are often, in the cultivated plant, irregular in size and form in the same flower, while they vary in number in different blossoms. They are at first erect but afterwards follow the curvatures of the corolla; and, just at the bend, they often present a slight excrescence or fold, representing perhaps the traces of an anther. The second row of the corona consists of from forty to fifty erect, lanceolate, one-nerved segments (staminodes ?), half the length of the corolla, or even more, united together for fully half their length, whitish or cream-coloured on the inner surface, pink externally at the base, and pink on both surfaces at the infolded apex of each segment. In some flowers, not only is there a pink spot on the outer surface of the base of each segment, but there is also a little fold opposite to the similar process in the outer row, and the full significance of which will be better seen when some of the other forms are described. Within the second row of the corona are placed the stamens, about twenty in number, adherent for a short distance to the base of the preceding whorl, and also coherent one with another for the greater part of their length. A slight separation between every four shows that there are really five phalanges of stamens, each phalanx consisting of four filaments, of which the two outer only are usually furnished with anthers, while the two

central ones are barren. These phalanges, or compound stamens, are placed opposite to the petals. In form the filaments resemble the segments of the second whorl of the corona; they are cream-coloured for the greater portion of their extent, but the points are of a pale claret-colour. Their basal portions are erect, or nearly so; as they separate from the corona they bend inwards towards the centre of the flower in a nearly horizontal direction; while their points are first bent downwards and outwards, and then a little inwards, so as to bring the anthers beneath the stigma and between it and a thick fleshy disk placed around the ovary. In the case of the sterile filaments the last curve inwards does not occur. The number of perfect anthers is generally ten, as before said; but the number varies in different flowers from five to fifteen. Owing to the points of the sterile stamens being bent in a different direction from the fertile ones, the anthers come so close that four, or five, or more seem to be in immediate proximity one to another; and this evidently led Palisot de Beauvois to describe and figure them as five stamens each bearing two anthers. The anthers in all the flowers that I have examined are one-celled and extrorse—though, from the peculiar way in which the stamens are bent, the face of the anther is turned towards the style; occasionally at the back of the anther may be seen little folds, which may be the traces of a second anther-cell. Within the stamens is an annular, fleshy, yellow disk, obscurely lobed on the inner surface, and forming a shallow cup round the style. The ovary is deeply sunk within the tube of the calyx, or, rather, within the dilated and expanded top of the flower-stalk. It is divided into four or five compartments, each compartment having four ovules in a double line attached along its inner angle. In some flowers there is a tendency towards obliteration of the partitions and placentas in the upper part of the ovary, so that it becomes partially and spuriously one-celled, and the portion of placenta that remains assumes an appearance as though it were a direct prolongation of the axis (free central). The ovules themselves are horseshoe-shaped, with a very short horizontal funiculus. Surmounting the ovary is a thick, cylindrical or somewhat angular fleshy style, terminated by a flat, tabular, four- or five-angled stigma, which is marked on the upper surface by four or five radiating peach-coloured lines, the lines starting from a central depression, and terminating in a similar glandular pit alternating with the sepals, so that the stigmatic lobes themselves are placed opposite to the lobes of the calyx.

Such is a general description drawn up on the examination of the living plant, and comprising only the more important points and such as offer points of contrast with dried specimens. I have only to add that the fresh flowers have a slightly acid odour, and that their duration is very short.

Before proceeding to show in what points the plant just mentioned differs from those which have been described by various authors, I will give briefly the results of my examination of the specimens in the herbarium at Kew from the various collectors before alluded to, taking them in chronological order. Heudelot's specimen is too imperfect to allow of satisfactory examination. Its leaves correspond well with those of the living plant; it has a single unexpanded flower placed in the axil of one of the leaves. This is the plant which Jussieu made the type of his species *N. Heudelotii.*

Whitfield's dried specimens correspond in all respects, as far can be ascertained, with the living plant in the gardens. Its flowers are of a deeper colour than most of the others.

Vogel's specimens have smaller and more ovate leaves, and the flowers are smaller and of a paler colour. Planchon describes the anthers as ten in number; as in the preceding, the flowers are solitary and axillary.

Barter's illustrations have elliptical leaves four to five inches long; the flowers are solitary, or sometimes in threes, and, as the collector says in a note, "very variable in colour, sometimes red, at other times nearly white." The flowers are hardly more than half the size of those of the Kew plant, corresponding in this respect with those of Vogel. The first row of the corona consists of about seventy linear-lanceolate segments, all uniform in size. The sterile filaments are rounded at the end. As the flowers had been much injured by insects before they were gathered, it is not possible to make out clearly the structure of the inner portions.

The specimens gathered by Mann in Old Calabar have large lanceolate leaves, seven to eight inches long, tapering at the base, acuminate at the apex. The flowers are in axillary clusters of three or four, the sepals are glandular at the margins, the corolla is similar to that in the Kew plant in size and appearance, but is much paler in colour. The first row of the corona consists of a number of lancet-pointed segments, all about equal in size and shape; they have at the base on their *inner* surface a slight fold, indicating, perhaps, the existence of an anther in that situation. The second row of the corona corresponds in all important parti-

culars with that in the living plant, except that there is a more distinct fold on the outer surface of the base of each of the segments, just opposite to the similar process on the inner surface of the outer row. The anthers are about ten in number, one-celled, the barren filaments being rounded at the extremity, not acutely pointed as in the living plant.

The specimens from the same collector, gathered at Fernando Po in November 1860, seem to differ in some respects from those that have been previously described; but these differences appear to me not to be sufficiently important to do more than constitute a distinct variety. In the following remarks I confine myself to the points of comparison with the forms from other localities. The leaves are eight or nine inches long, roundish or subcordate at the base, obovate, acuminate. The flowers are pale in colour, solitary and axillary, the calyx glandular, the corolla rather smaller than that of the living plant, but larger than that of Vogel's or Barter's. The first and second rows of the corona are like those of the Old-Calabar plant, as also are the stamens; the anthers are extrorse, one-celled, and irregular in number.

From what has been just said, it will be seen that in the plants in question there are slight differences in the form and size of the leaves, in the number of the flowers, in the size, colour, and form of the various whorls of the flower. I shall now proceed to contrast these points of difference with the recorded descriptions and figures in the various works to which I have had access; and this comparison will, I believe, enable me to draw correct inferences as to the value of the proposed specific distinctions between these plants.

Palisot de Beauvois's figure* corresponds in general aspect pretty closely with the living plant, but in certain matters of detail it differs materially. The figure shows a branch of a shrub or tree with leaves like those of the cultivated plant, while the flowers are represented of a *blue* colour, solitary in the axils of the leaves, and some of them springing from the old wood just as in the living plant. In the description the flowers are spoken of as axillary, and arranged "par bouquets," while their colour is described as "d'un beau bleu avec un reflet violet." The sepals have two small marginal glands, one on each side near the apex. The corolla is described as double, comprising what I have mentioned in the living plant as the corolla, and the second whorl of the corona, the outer series having, apparently, been omitted

* Flore d'Oware et de Benin, ii. 29, t. 78.

both in the description and in the drawing. The corolla is represented as spreading horizontally; and, perhaps from the drawing having been taken from dried and therefore flattened specimens, the corona, or, as Palisot de Beauvois calls it, the inner corolla, is represented as spreading horizontally like the corolla and as being of the same blue colour. The stamens are described and figured as five in number "singula biantherifera," the anthers two-celled, though the figures resemble one-celled anthers. The stigma is mentioned in the following terms, which would apply equally well to the living plant, "Stigma complanatum, peltatum, antheras obtegens, quinqueangulare, angulis medio sulcatis, stellam marinam [*Asterias*] æquantibus." The fruit is said to be a many-seeded unilocular berry, with the seeds imbedded in pulp; but the drawing rather shows a free central placenta bearing an indefinite number of ovules! The chief points in which this differs from the cultivated plant are the absence of the first ring of the corona, evidently by mistake, the spreading direction of the second (perhaps also an error of the artist), and the arrangement of the stamens, which, however, is a point that, as I have before mentioned, might easily be considered correct from a superficial examination. The blue colour is probably the result of an error of memory, coupled as it is with "un reflet violet" and with Whitfield's statement of the bluish colour which his flowers had when drying. Jussieu, who saw Palisot de Beavois's original specimens and compared them with those gathered by Heudelot, considered the latter distinct, and published the species as *N. Heudelotii* in 1844 (Ann. Sc. Nat. sér. 3. vol. ii. p. 223, t. 4), though the only points of distinction that he lays down are the solitary axillary flowers of a reddish purple colour in the one case, as contrasted with the tufted blue flowers of Palisot de Beauvois's plant. Jussieu describes the outer corona, which Palisot de Beauvois had overlooked. He considers the lobes of the second corona to alternate with those of the first, a position which may be theoretically true, but which I have tried in vain to verify in the cultivated plant, wherein I find that the number of the outer segments is too irregular to allow of their relative position being satisfactorily ascertained. The fourth or staminal whorl Jussieu describes as of the same form as the preceding, with which it is fused at the base, but elsewhere is distinct, "et découpée supérieurement en cinq parties, dont chacune soutient seulement deux anthères ovoïdes, oblongues, uniloculaires, quoiqu'elle soit parcourue par un plus grand nombre de ner-

vures longitudinales, par quatre en général." This corresponds closely with what I have observed in the living plant. A. de de Jussieu describes also the pollen as triangular, like that of an Onagrad. It is not necessary for me to quote Jussieu's description at any greater length; but I may add that in accordance with this description he drew up revised characters for the genus, and published a plate with diagrams, &c., in which the form and position of the several organs are represented in conformity with the description.

Not to mention other botanists who have published accounts of the genus derived from the statements of De Beauvois and Jussieu, rather than from their own observations, such as Robert Brown, De Candolle, Desfontaines, &c., I pass on to the description written by Dr. Lindley, in the Botanical Register, 1844, and in the Gardeners' Chronicle of the same year, p. 780, in which latter woodcuts are given. Dr. Lindley examined dried flowers, and others in spirit, that were collected at Sierra Leone by Whitfield. He gives some details of the anatomical structure of the wood which have not been noticed by any other observer. He mentions the flowers as growing in groups of three in the axils of the leaves, and alludes to Whitfield's statement that, when decaying, they assume a bluish tint, which has probably led to De Beauvois's error in representing them as "almost wholly blue in their perfect state." The corolla and the two whorls of the corona are described exactly as they were found by me in the flowers that I have examined. The stamens are mentioned as twenty in number, linear-lanceolate, with erect, oblong, two-celled anthers. Can it be that in Lindley's specimens all the twenty filaments bore anthers? This is possible, but it is hardly likely they were two-celled, still less likely that they were erect; indeed, in the drawing in the Gardeners' Chronicle, where half a flower is shown, there are ten one-celled anthers bent downwards and inwards in the ordinary way. The fruit is as large as a pomegranate, and not unlike one in appearance. The remaining points in Dr. Lindley's description it is not necessary to allude to, with the exception of pointing out an error in the figure (to which the Dr. himself called attention), in which a third row of the corona is made to appear between the second row and the stamens. This third row (or, as Lindley calls it, fourth ring of the corolla) has no real existence.

In the year 1848, in the Botanical Magazine, tab. 4387, Sir

W. Hooker published a figure and description of *Napoleona imperialis*, founded upon living specimens from Sion-House Gardens, which had been derived originally from Mr. Whitfield, and were therefore from the same species as those which had been examined by Dr. Lindley. The drawing in question was made by Mr. Fitch, and is accurate so far as it goes. Sir William himself adds but little to what was previously known concerning the plant, but confines himself to a *résumé* of what had been written by previous authors. In the description of Mr. Fitch's section of the flower, however, occur the following remarks:—"Judging from this section, what is in the generic character called the inner of three whorls or series of the corolla [second whorl of the corona] might rather be considered as a second and outer series of filaments which are abortive; according to this view the corolla would be in a double series [including thus the true corolla, and the first ring of the corona], and the stamens in a double series." Sir William concludes that Jussieu's *N. Heudelotii* is the same as the original *N. imperialis*.

Still treating of plants derived from Whitfield originally, we find Decaisne publishing in the Revue Horticole for 1853, t. xvi., a description, accompanied by a very indifferent figure of *N. Whitfieldii*, the species so named being, of course, the same as that described by Hooker and Lindley as *imperialis*. The main points in Decaisne's description which need be here mentioned are, that the flowers are said to be solitary, while the calyx and corolla, with the two rings of the corona, are described in almost exact accordance with the conformation as seen by myself. Decaisne, however, describes the stamens as ten in number, thus:—"Les 5 groupes d'étamines se composent chacun en apparence de 4 filets enroulés sur eux-mêmes, les deux latéraux portent seuls des anthères, ceux du milieu sont stériles . . . . . . Les étamines sont donc opposées aux lobes de la corolle et les filets stériles à ceux du calice; . . . . . . les anthères sont biloculaires." Moreover the flowers are said to wither in the evening after their expansion, and to have a peculiar smell, like sea-weed. Decaisne's account of the stamens, then, corresponds closely with my own, and does not greatly differ from that of Palisot de Beauvois and A. de Jussieu, except in points that were, I believe, overlooked by his predecessors. From Lindley's account it differs in the number of the anthers. Decaisne, it will be seen, describes the anthers 2-celled, and considers the sterile filaments opposite to the calyx—a position a little different from what I imagine their true position to be.

In the description drawn up by our learned President* may be found a lesson to those who would generalize upon insufficient data. With his vast knowledge of plant-structure, and particularly after a careful study of the genera of *Myrtaceæ*, to which both *Napoleona* and *Asteranthus* are referred, Mr. Bentham, nevertheless, speaks doubtfully upon the structure of this extraordinary flower. Omitting such portions of the description as are not relevant to my present purpose, I quote merely those portions relating to the organs intermediate in position between the calyx and the pistil, "Petala 0? Staminodia? staminaque in series 4 concentricas ima basi plus minus connatas disposita, seriei exterioris (petala?) in membranam orbiculatam petaloideam 20–40-plicatam connata, seriei secundæ numerosa, libera v. vix basi connata, anguste ligulata, ananthera, seriei tertiæ in cupulam supra medium 20–40-lobam lobis inflexis anantheris connata, seriei intimæ basi inter se et cum serie tertia connata, superne libera, late ligulata, alia ananthera, alia (rarius omnia?) antherifera; antheræ oblongæ, adnatæ, uniloculares. Discus in vertice ovarii annularis." From this it will be seen that my description (originally drawn up some time before the publication of the 'Genera') differs merely in considering the broad orbicular membranous plate immediately within the calyx as a true corolla, and not as a series of staminodes—a difference of very trifling nature. I should also prefer to speak of the disk as encircling the ovary, and partially adnate to it, rather than in the words used by Mr. Bentham above cited.

The most recent account is that of MM. Le Maout et Decaisne†. In the description of the Order *Napoleoneæ*, the corolla of *Napoleona* is described as double, "l'extérieure subrotacée, nervoso-plissée, entière; l'intérieure rayonnante, multifide. Etamines insérées au fond de la corolle, 5 pétaloïdes, à 2 anthères." In this description, what I have considered the first row of the corona is called the second of the corolla—a difference of no very great moment. But nothing is said as to the second row of the corona; while the description of the true stamens is, to say the least, rather ambiguous.

The plant called *N. Vogelii* has now to be mentioned. The species was founded by Dr. J. D. Hooker and M. Planchon upon specimens gathered by Vogel at Cape Palmas (Niger Flora, p. 360, tab. 49). The only points in the description on which it is here

* Benth. et Hook. Gen. Plant. vol. i. p. 723.

† Traité Général de Botanique, p. 287.

necessary to comment are the following:—The petioles are described as not thickened (haud crassis). The anthers are said to be ten, each one-celled; while the fruit, of which good specimens still exist in the Museum at Kew, is described as "bacca corticosa, magnitudine et facie fructus Punicæ, cortice extus rubescente punctulis albis crebre consperso, septis pulposis in spec. nostris exsiccatis et semicollapsis et cum integumento seminum conglutinatis." Mr. Bentham, in commenting on this description, merely gives his opinion with some doubt that the *N. Heudelotii* and *N. Vogelii* are not really specifically distinct from the original *N. imperialis*.

Such, then, are the main structural points as recorded or figured by various observers, or as observed by myself. I have endeavoured to show how far the discrepancies between the various statements may be explained or reconciled; and I may now add, in all deference, that, in my opinion, they can hardly be taken to furnish points for specific distinction, seeing that they are either too inconstant and variable, or, as in the case of the blue colour of which Palisot de Beauvois speaks, as well as in that of the two-celled anthers mentioned by Decaisne and Lindley, errors of observation.

The points of distinction cited by Decaisne (as follows:—

1. *N. imperialis*, flowers in groups of three, blue;
2. *N. Heudelotii*, flowers solitary, reddish-purple;
3. *N. Whitfieldii*, flowers solitary, red and yellow;
4. *N. Vogelii*, flowers solitary, red and yellow)

are obviously insufficient, as being inconstant and variable, and not borne out by more complete examination. The only points that remain are the form and size of the leaves, the size of the flower, and the shape of the lobes of the corona; but these appear to me to indicate varieties rather than species.

As to the morphology of the flower I have little to offer. I should regard the calyx as consisting of five sepals, the glands indicating the base of the abortive laminæ as in the true leaf. With the lobes of the calyx alternate the lobes of the corolla, the ribs of which latter I consider equivalent to the rays of the first and second lobes of the corona, but tied together by intervening cellular tissue. The segments of the corona or staminodes are adherent to a certain distance to the stamens, which latter I should consider "compound" or 5-lobed, some of the lobes antheriferous, the others sterile. The disk is clearly a prolonga-

tion of the cup-shaped thalamus, and demands no further notice; nor is it necessary to add any remark as to the pistil.

As to the affinities of *Napoleona*, no doubt the nearest relationship is with the Brazilian genus *Asteranthus*, as has often been pointed out. From an examination of Spruce's specimens of the latter plant, it becomes evident that the main differential characters of *Asteranthus*, as contrasted with *Napoleona*, are the following:—The calyx is many-toothed (20–30). There is but a single corolla, almost exactly like that of *Napoleona*; there is no corona between the corolla and the pistil, the place of the staminodes being occupied, as it would seem, by numerous filiform stamens. I have not been able to ascertain the point with certainty; but my impression is that the numerous stamens of *Asteranthus* are in the first instance, as they certainly are in *Napoleona*, collected together into 5 groups or phalanges, each of which represents a compound stamen, as in *Malvaceæ* etc. Moreover in *Asteranthus* the anthers are truly bilocular, and the disk, which is so prominent in *Napoleona*, is very much smaller. The style and stigma are very different in size in the two genera. The fruit of *Asteranthus* is not yet known.

It is not necessary to discuss the affinities of this singular group at any length. It has been placed between *Cucurbitaceæ* and *Passifloraceæ* by Jussieu and Palisot de Beauvois, near *Symplocaceæ* by Desfontaines and Endlicher, next to *Rhizophoraceæ* by Lindley. Decaisne and Maout consider that the *Napoleoneæ* approach *Combretaceæ* by their "ovaire infère 1-loculaire;" this is clearly an error, as the ovary is only partially inferior and is five-celled; nor does the affinity seem very close, even if allowance be made for this. In a still more remote degree there is an affinity with *Calycanthaceæ* and *Granateæ*; while even *Nymphæaceæ*, in most points widely different, are similar in the great development of the disk. Lastly, Bentham and Hooker place the two genera among *Myrtaceæ*, which seems the most fitting resting-place of any that have hitherto been proposed for them.

Dimorphism of Flowers of *Cymbidium tigrinum*. By the Rev. C. Parish. (Communicated by Dr. Hooker.)

[Read June 18, 1868.]

When on Moolee (Moalmayne) Island a few days ago, I noticed two very different flowers on the same plant of *C. tigrinum*, in hundreds of cases; for the plant is found there in great quantity. On the same stem there would be two or three flowers of the ordinary colour, *i. e.* of the colour and appearance originally known to me, and as represented in the 'Botanical Magazine,' and one or two (always the lowest on the stem) presenting a different appearance. These last are of a different colour, and so strike the eye at once. They are of a rich red colour throughout, and are rather blotched than striped. The effect of the contrast of colour on the same plant is very effective, and has raised the plant much in my estimation. I thought it rather

Fig. 1.

Front view. Side view.

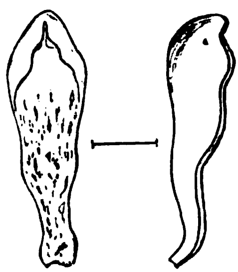

Fig. 2.

Front view. Side view.

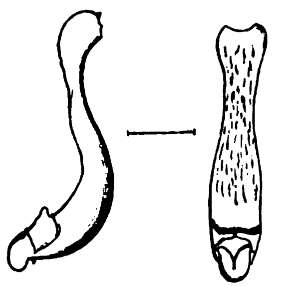

Fig. 3.

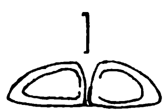

Fig. 4.

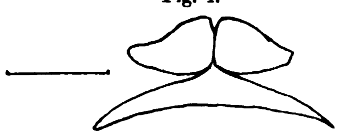

Fig. 1. Column of barren flowers. Natural size.
Fig. 2. Column of perfect flowers. Natural size.
Fig. 3. Pollen-masses without gland, in intermediate flower. Magnified.
Fig. 4. Pollen-masses with gland, of perfect flower. Magnified.

a poor thing at first; but as then seen by me in profusion (five and six flowers on one stem, and many stems on one plant, the flower,

too, being in two different colours) I thought it was a very handsome plant. On examining the flowers, I found that they were differently formed. The terminal flowers were, in colour and form, normal and perfect in all their parts (see fig. 2). The darker-coloured flowers (being, as I said, when present, always the lowest on the stem) were all imperfect. The column was much thickened, both dorsally and laterally, and less curved. There was no anther, and there were no pollinia; but the upper edges of the column were turned over as represented in fig. 1; and underneath these edges was seen a small quantity of a yellow waxy substance in an amorphous state, being all that existed to represent the pollinia. I must mention that on many stems there were flowers (always, be it remarked, intermediate on the stem) of an intermediate character, with no anther, having the column only a little smaller; and in these were found perfect pollinia, but no triangular gland.

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END OF THE TENTH VOLUME.

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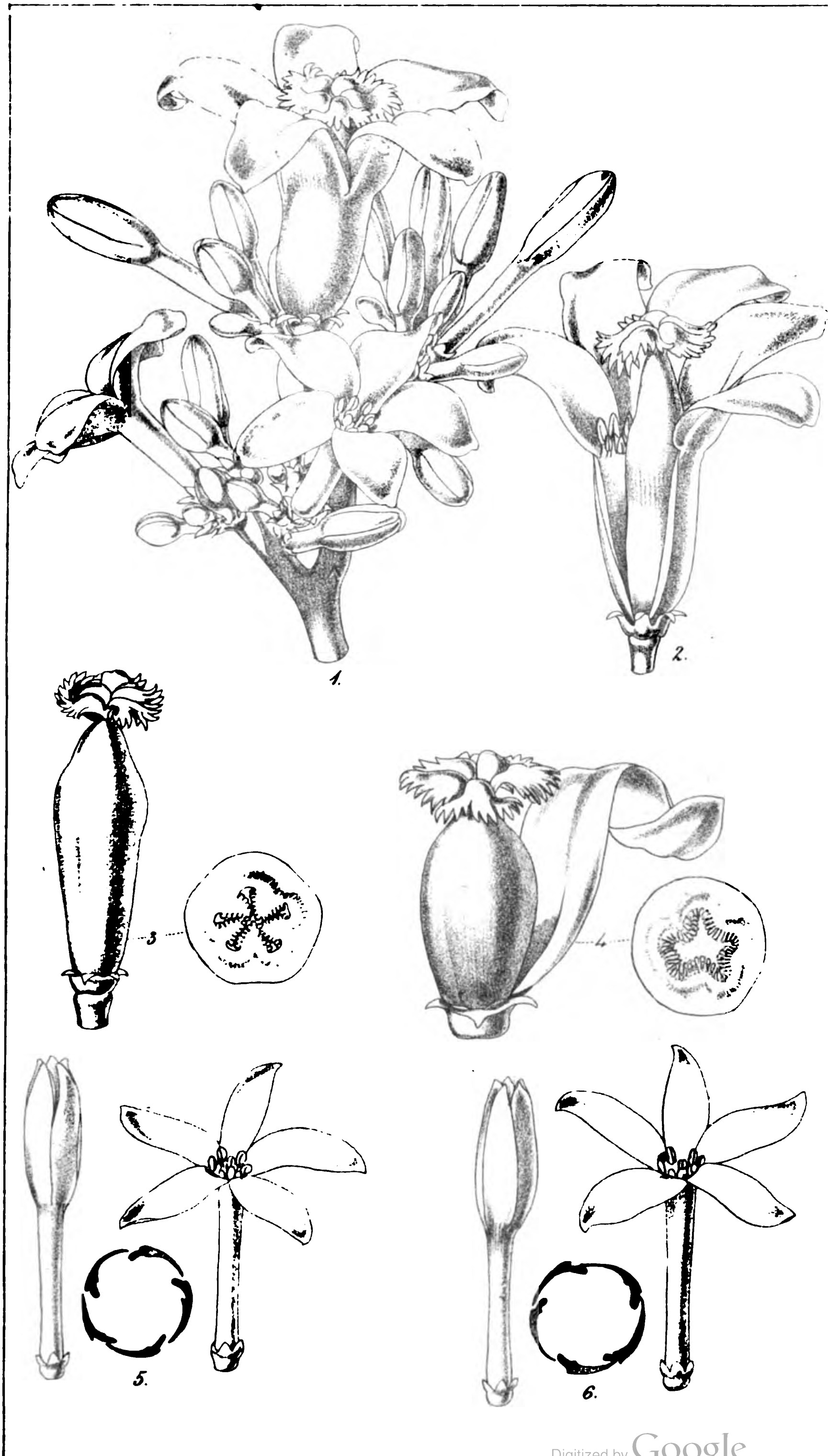

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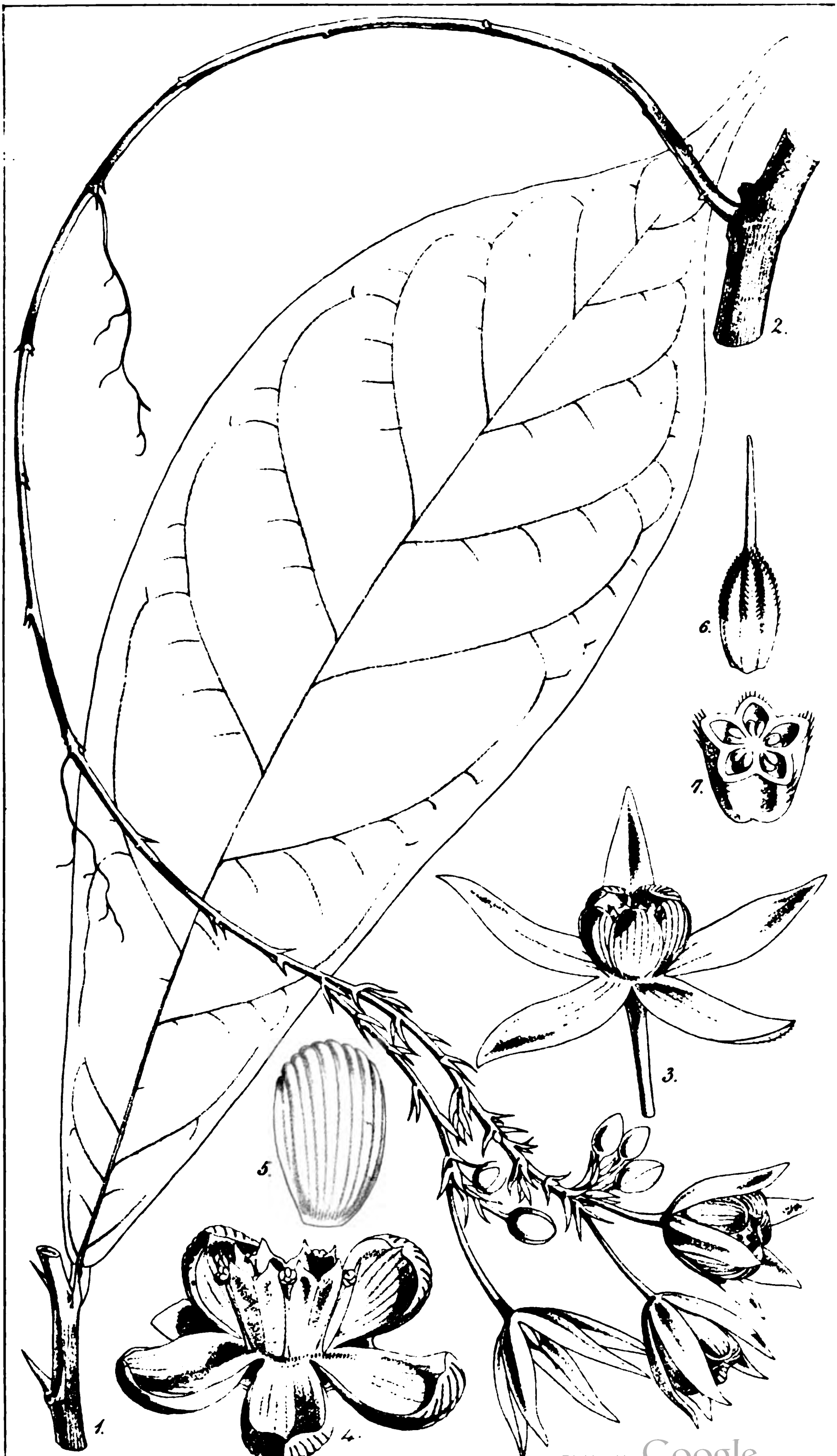

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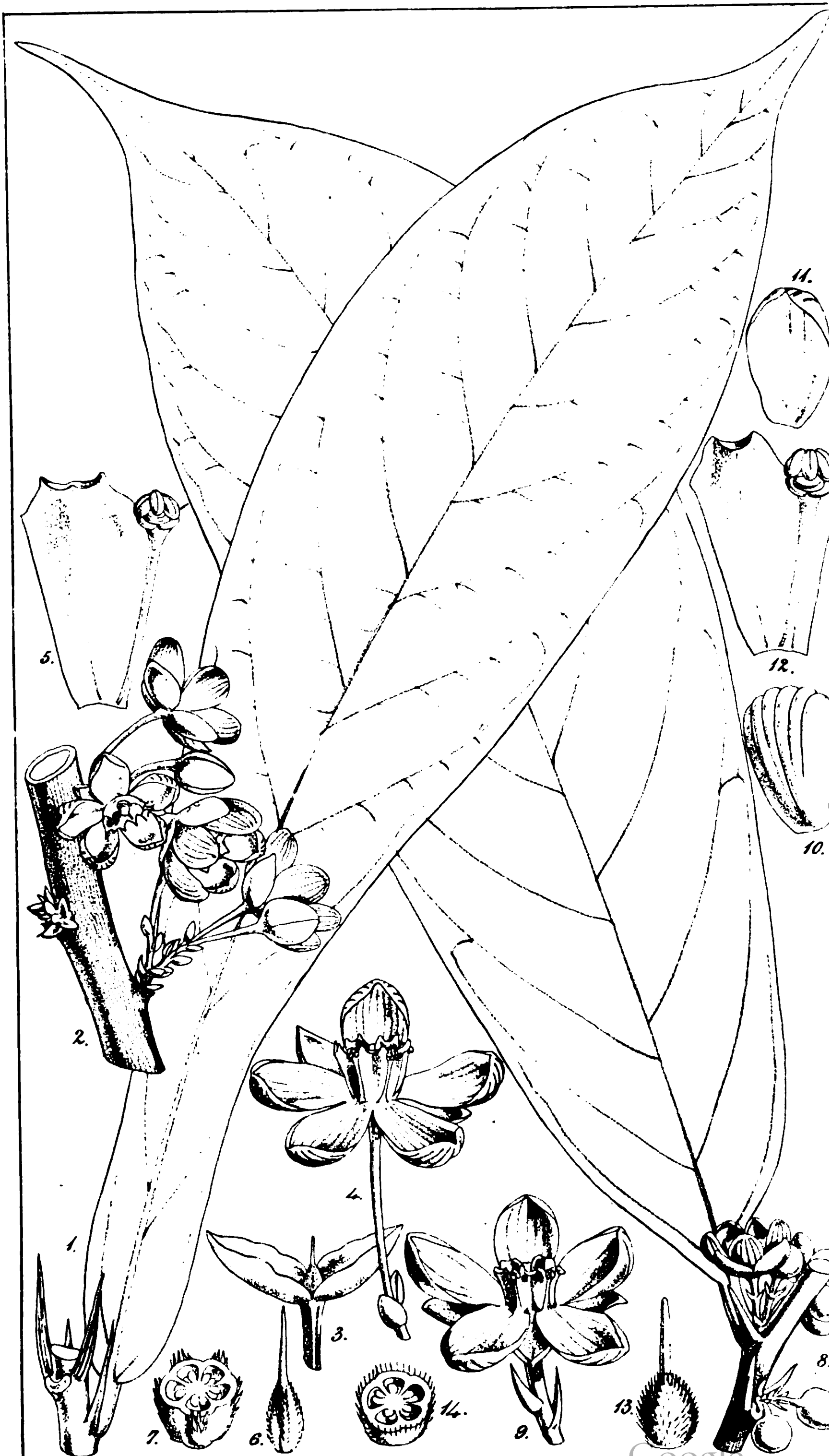

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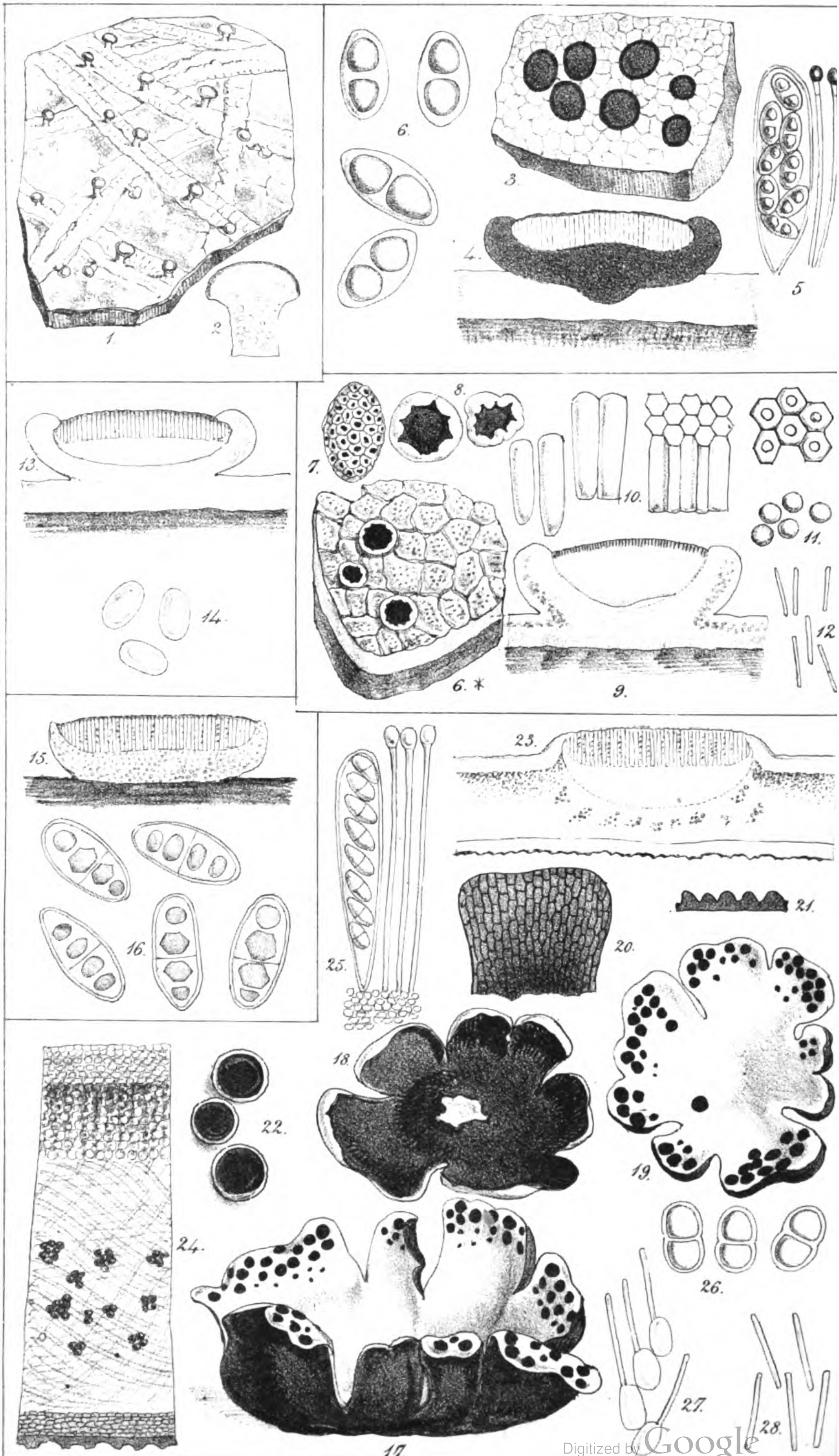

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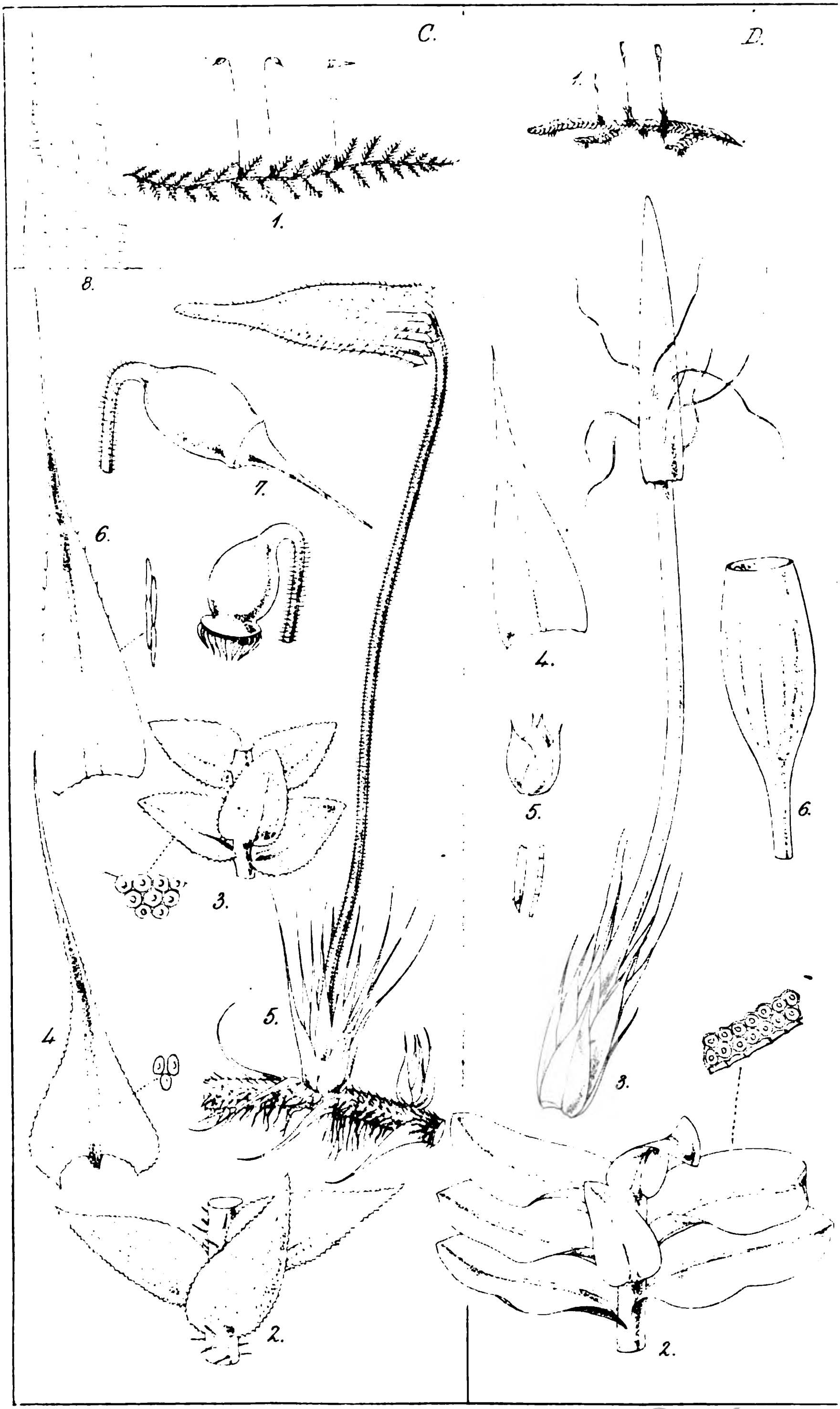

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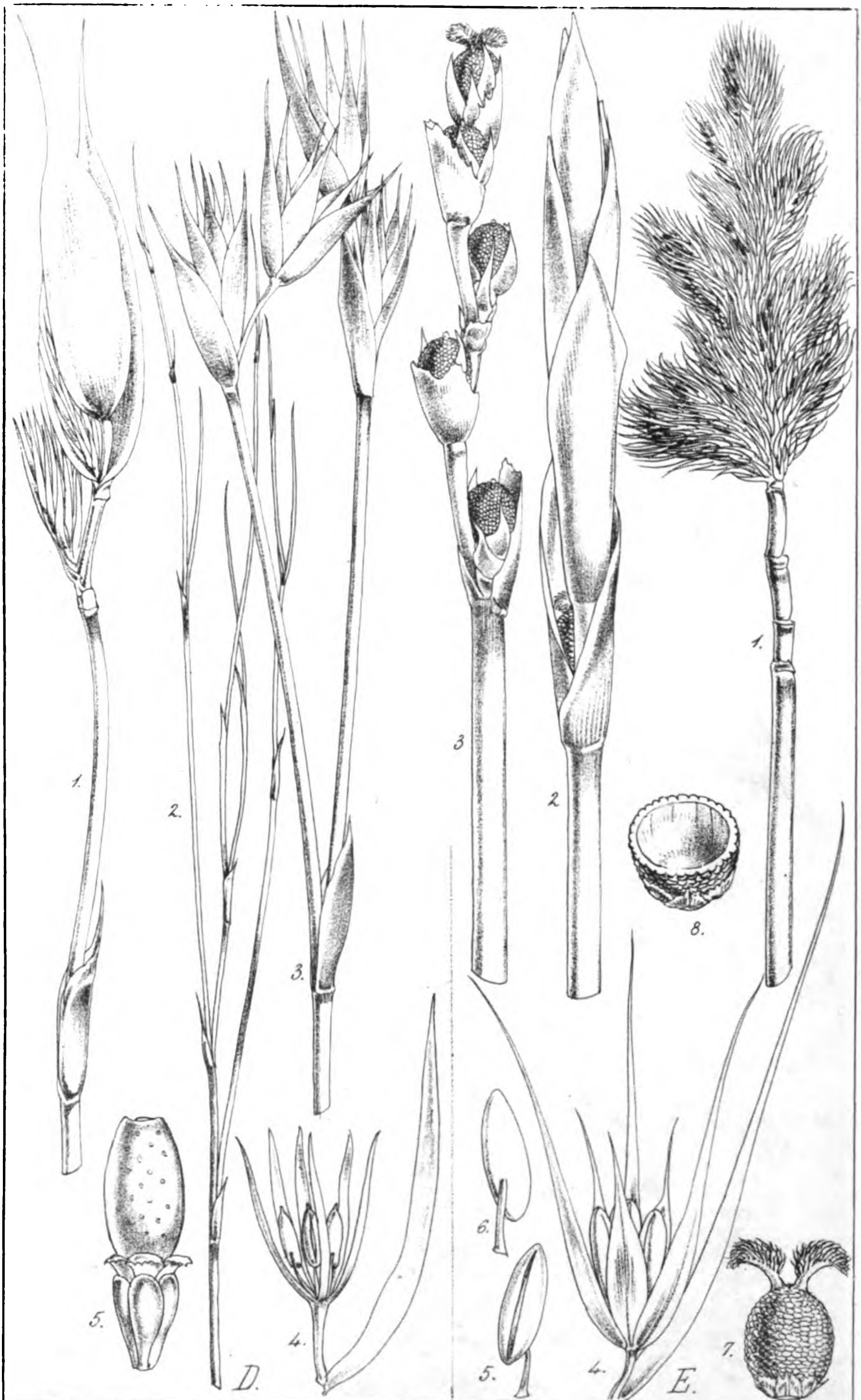

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J. N Fitch, imp.